Running head: Training tutors and parents on discrete-trials teaching

Training Tutors and Parents to Implement Discrete-Trials Teaching with Children Diagnosed with Autism

by

Daniela Fazzio

A Dissertation submitted to the Faculty of Graduate Studies

in partial fulfilment of the requirements of the degree of PhD

Department of Psychology

University of Manitoba

Winnipeg

Copyright © 2007 by Daniela Fazzio

Training tutors and parents on discrete-trials teaching

To Toby

Acknowledgements

I thank…

My advisor Dr. Garry Martin for giving me so much of what I wanted the most from this journey: learning. I wish it were measurable like gold or diamonds, and then it would be much easier to convey the magnitude of my gratitude. It has been a great honour to be his student.

My committee for their contribution to such a positive experience and successful project.

St. Amant and the St. Amant Research Centre for supporting the research, and the parents and children who participated for their interest, support, and commitment.

My team of helpers for their diligent work and their appreciation and respect for the importance that I attribute to the methodological integrity of this project.

My mom, as I have at each milestone, for how she brought me up, for her remarkable investment, for fostering the values that would define me and permeate my every step; and all without even knowing that her strategies were best practice. Also for keeping strong through this long time apart in acknowledgement of the only thing that could stray me from my dreams.

Toby for being by my side, assuring me love, sharing his brilliance, for being so honest, for giving so much, trying so hard, outdoing his limits; for making me better.

Toby's family for taking me in, sharing their life and giving me one.

Nickie for our unspoken complicity, for the hugs, smiles, the sincere encouragement, and abundant love.

My dad for finally discovering me, for letting me know him, and for taking very good care of himself.

Maria Amália for planting the seed with Science and Human Behavior in a distant 1993, and for her mentorship and support since then. PUC, it would never have been the same without you.

Angela for inviting me here, for always being *there* for me, for recognizing and validating my work and everything that I bring to it.

Abstract

Discrete-trials teaching (DTT) is one of the principal techniques used in Applied Behaviour Analysis programs for children with autism. Although the demand for training individuals to implement DTT is high, published studies on strategies to do so are few. I conducted two experiments to investigate a training package for teaching individuals to implement DTT. In Experiment 1, I used a modified multiple-baseline design to evaluate the training package for teaching five university students to implement DTT to teach three tasks to a confederate role-playing a child with autism. Also, in an AB within-subject design with each participant, I compared two components of the training package, a Self-Instructional Manual and Feedback plus Demonstration. Experiment 2 was a systematic replication of Experiment 1, with 2 teaching assistants, a resource teacher, and 3 parents of children with autism as participants. In both experiments I assessed the generalization (G1) of participants' ability to implement DTT (while teaching the confederate) to teach tasks not targeted for Feedback plus Demonstration, as well as generalization (G2) of DTT while teaching a child with autism. After an average of approximately 3 hours to master the self-instructional manual, participants' DTT accuracy in both experiments improved from an average of 34% in Baseline to an average of 61% following the Self-Instructional Manual. Results appeared to be due to the Self-Instructional Manual phase for 9 of the 11 participants. Following an average of 35 minutes of Feedback plus Demonstration of DTT of one task, participants' DTT accuracy improved to an average of 91% while teaching a confederate. The improvement appeared to be due to the intervention with 10 of the 11 participants. The participants' DTT accuracy averaged 90% during G1 and 86% during G2. These results demonstrate that this training package has considerable potential for teaching DTT to tutors, educational assistants, and parents of children with autism.

Table of Contents

List of Figures

Training Tutors and Parents to Implement Discrete-Trials Teaching with Children Diagnosed with Autism

Early intensive behavioural intervention for autism based on Applied Behaviour Analysis (ABA) has become a widely available and recommended model of intervention for individuals diagnosed with autism (New York State Department of Health, 1999; General Surgeon, 1999). The model involves one-to-one teaching conducted by paraprofessional staff (e.g., tutors) and parents, supervised by psychologists with advanced training in ABA.

An important technique widely used in ABA early intervention is discrete-trials teaching (DTT). A discrete-trial is a small unit of instruction, consisting of the presentation of a clear antecedent (S^D) by an instructor (tutor, teacher, parent), the child's response, and the presentation of an appropriate consequence by the instructor (Smith, 2001). The antecedents can be instructions from the instructor, a set of teaching materials, a series of environmental or instructor prompts, or some combination of these in order to increase the likelihood of a correct response by the child. The immediate consequences typically include praise and some other type of reinforcer, such as a preferred edible or toy. The DTT technique capitalizes on the arrangement of multiple teaching opportunities that ensure that appropriate behaviours occur and are practiced and reinforced under desired stimulus control, while errors are minimized by the use of prompting and prompt-fading procedures, and corrected systematically when they occasionally occur. Children diagnosed with autism have been taught a variety of pre-academic, academic, social, self-care, and language skills through the implementation of DTT.

While considerable research has demonstrated the effectiveness of DTT for children diagnosed with autism, relatively few studies have examined methods for training staff and parents to implement this procedure. This research evaluated the effectiveness of a training

package to teach DTT to participants.

ABA and Autism

Ivar Lovaas pioneered a model of behavioural intervention that has come to be known as ABA programs for autism (Malott, 2005). His model combined procedures that were developed by researchers of ABA in the 1960s and 1970s in a treatment package aimed at teaching basic skills to children with autism (Lovaas, 1981). Outcomes of this model of intervention have been described in a seminal paper (Lovaas, 1987) that became the main resource for researchers, practitioners, and advocates, to persuade other professionals, advocates, and governments about the effectiveness of ABA. Lovaas's report of the outcomes obtained by a controlled group comparison study indicated that a large percentage (47%) of children who received the early intensive behavioural intervention achieved "normal functioning" according to standardized assessments and follow-up of school placement.

The reported outcomes and the persuasion of families who had already been implementing ABA programs resulted in an impressive movement of advocates pursuing ABA treatment for children with autism throughout North America. Replication sites were established and have continued to further develop and test the model, yielding additional evidence of the effectiveness of the approach (Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; McEachin, Smith, & Lovaas, 1993; Lovaas; Smith, and McEachin, 1989; Lovaas, 1987). The model's essence is the implementation of behaviour analytic procedures to teach skills and eliminate challenging behaviours, initiated as early as possible (e.g., 24 months of age), and implemented intensively (e.g., 40 hours per week) for a minimum of 2 years (Lovaas, 1981; Maurice, Green, &Luce, 1996; Sundberg & Partington, 1998; Maurice, Green, &Foxx, 2001; Lovaas 2002).

Curricula used in early ABA intervention include skills in the areas of cooperation (e.g., responding to instructor), attention (e.g., attending to teaching instructions and materials), language (e.g., requesting, labelling, receptive language), gross and fine motor skills (e.g., running, jumping, balancing, copying, writing)), self-care (e. g., toileting, bathing, dressing), pre-academic and academic skills (e.g., math, reading), school readiness, leisure and play, and socialization, in addition to a primary goal of eliminating challenging behaviours (Romanczyk, Lockshin, & Matey, 2001; Weiss & Piccolo, 2001; Meyer, Taylor, Levin, & Fisher, 2001; McGee, Morrier, & Daly, 2001; Harris, Handleman, Arnold, & Gordon, 2001). An organized overview of a variety of well-established models of early intensive behavioural intervention, in home-based, centre-based, and residential settings, can be found in Handleman and Harris (2001).

The St Amant ABA Program for Children with Autism

The Province of Manitoba has been offering ABA early intervention services to preschool children with autism since September of 2002, following a 3-year pilot project, through the St Amant ABA Program. Children receive 36 hours of one-to-one intervention per week; 31 of which are conducted by trained St Amant tutors, and five of which are delivered by the child's parents, who are trained by St Amant staff to work with their children. The St Amant ABA Program has developed a multi-component DTT package to teach language and academic and pre-academic skills to its clients. The present research evaluated a training package to teach that DTT strategy to potential tutors and to parents of children with autism.

Training Staff to Implement Behavioural Interventions with Persons with Developmental Disabilities and/or Autism

During the past 40 years, a number of behaviour analytical studies have targeted training

competencies of staff implementing behavioural interventions to clients with developmental disabilities and/or autism. Even after decades of research, some questions remain, such as 'What do paraprofessionals need to know to be able to implement behavioural interventions?', 'Do they need to understand the principles behind the procedures?', 'Do they need to be trained in the principles of behaviour analysis to be able to implement accurately the procedures designed by behaviour analysts?' Thus far, the scientific literature provides no "one answer". Handleman and Harris's (2001) compilation of behavioural service models is one source of information on the training protocols used to train staff in those services. Most of the descriptions of staff training practices lack information on the curricular component (e.g., basic principles of behaviour), but present brief descriptions (e.g., workshops, video demonstrations) of initial and ongoing training strategies.

Many of the reviewed studies have employed behavioural techniques to train paraprofessionals to work with individuals with disabilities by implementing a single strategy, for example feedback (Krumhrus & Malott, 1980; Leblanc, Ricciardi, & Luiselli, 2005); Gilligan, Luiselli, & Pace, 2007), or differential reinforcement (Lerman, Swiezy, Perkins-Parks, & Roane, 2000). Some studies also focused on generalization of skills learned, most often across tasks (e.g., motor imitation, reading), and on changes in client behaviour as a result of improvement in staff implementation of procedures (Wallace, Doney, Mintz-Resudek, & Tarbox, 2004; Koegel, Glahn, & Nieminen, 1978). For example, Ducharme and Feldman (1992) compared two strategies to enhance generalization of training effects with the general case training strategy, in which training occurs across a variety of stimuli (instructional universe) selected for training based on the conditions in which the behaviours trained are to be displayed (non-training condition). They trained 16 staff members to implement skill acquisition programs

with individuals with developmental disabilities in a residential setting. They demonstrated that the general case approach was superior to single case demonstration (i.e., one program targeted during training and generalization to teaching new programs were tested) and programming of common stimuli (i.e., clients were part of the training condition) in promoting generalization within and across programs. Ducharme, Williams, Cummings, Murray, and Spencer (2001) also implemented a general case training strategy combined with a quasi-pyramidal approach to train supervisors to implement programs and then teach them to train direct staff. Their results indicated that the performance of the supervisors improved just after training, but not to desired levels, which were later achieved upon practice while training their staff.

Examples of staff skills targeted in the literature include: conducting preference assessments (Lavie & Sturmey, 2002), conducting functional analysis (Moore, Edwards, Sterling-Turner, Riley, DuBard, & McGeorge, 2002; Wallace et al., 2004), using embedded instructions (Schepis, Reid, Ownbey, & Parsons, 2001), using delayed prompting (Hughes, Fedrick, & Keel, 2002), implementing differential reinforcement (Marcus, Swanson, & Vollmer, 2001), and conducting errorless compliance training (Ducharme & Drain, 2004; Ducharme, Popynick, Pontes, & Steele, 1996; Ducharme, Sanjuan, & Drain, 2007).

The majority of studies implemented a training package that included written or vocal instructions, modelling, role-playing and/or practice, and feedback (e.g., see Alpert & Kaiser, 1992; Krumhrus & Malott, 1980; Lerman et al., 2000; Realon, Lewallen, & Wheeler, 1983). Instruction seldom included pre or post-tests (Reid, Parsons, Lattimore, Towery, & Reade, 2005; Ryan & Hemmes, 2005; Moore et al., 2002; Greene, Kamps, Wyble, & Ellis, 1999; Parsons, Reid, & Green, 1996), & modelling was done in vivo (Sakoroff & Sturmey, 2004; Schepis et al., 2001) or via videotape (Wallace et al., 2004; Lavie & Sturmey, 2002).

While studies such as those cited previously provide a general foundation for the experiments conducted, the literature that is most relevant consists of experiments that have examined procedures for instructing tutors and parents to conduct DTT with children with autism.

Instructing Tutors and Parents to Conduct Discrete-Trials Teaching With Children With Autism

An early article by Koegel, Russo and Rincover (1977), reported results of a training procedure to train 11 teachers to implement DTT with 12 children with autism. They assessed the trainees on (a) presenting S^Ds (instructions), (b) presenting prompts (effective prompts that evoke a correct response), (c) shaping (reinforcement of successive approximations to the target behaviour), (d) managing consequences (immediate and contingent; reinforcement only to correct responses and extinction of incorrect responses), and (e) discrete trials (distinct onset, offset, and intertrial interval). Their training procedure included (a) a written manual describing the correct and incorrect uses of each component of the teaching procedure, (b) modelling through videotaped demonstration of correct and incorrect implementation of the components, (c) practice and immediate (every 5 minutes) and delayed (every 30 minutes) feedback, and (d) demonstration of correct responses following incorrect responding by the participants. Practice and feedback were repeated until the participant achieved proficiency, which occurred in less than 25 hours for each participant. Participants were trained across programs and also across children. Generalization of teaching ability was evaluated positively during tests with a novel task (e.g., trained in shoe lacing and tested in picture labelling). Children's performance was also tracked as a measure of the effect of the participants' ability to use the trained procedures, and results indicated that as participants improved in their teaching ability the children also improved in their skills. A limitation of the study is that there were no procedural reliability

assessments during the training sessions, and the intervention would be difficult to replicate based on the very brief description of the independent variables.

Koegel et al. (1978) tested two models for training parents as therapists for their children with autism utilizing the same DTT responses as the Koegel et al. (1977) study (i.e., instructions, prompts, consequences, shaping, and discrete trials). In this study, the authors compared the effectiveness of: (a) demonstration alone, and (b) lecture-plus-demonstration condition in training generalized use of the procedures by the participants. Demonstration consisted of the trainer working with the child for five trials while the parent watched. Lecture-plus-demonstration consisted of: (a) a lecture on the procedures and, (b) videotaped demonstration. Their results indicated that demonstration alone was effective for improving parents' implementation of the procedures when they had to copy the model (e.g., teach a child to follow the instruction to "stand up"), but performance did not generalize to new tasks (e.g., teach a child to follow the instruction to "put on coat"). In addition, correct responding by the children was assessed and improvements were consistent with parents' performance (i.e., children improved when parents implemented the procedure correctly and did not improve when parents trained skills failed to generalize to new tasks). The lecture-plus-demonstration condition however produced generalized responding by the parents and consistent improvement in children's performances. These results are interesting for consideration of costs and use of human resources in staff training, as they demonstrated that trainees could learn from models without direct contact with trainers, to demonstrate skills or to provide feedback or answer questions.

Whereas the studies of Koegel et al. (1977) and Koegel et al. (1978) present important information on training strategies, the components of their DTT procedure are simpler than the

multi-component procedure used in the St Amant ABA Program. As will be described later, the measurement of DTT that is proposed comprises 19 trainee responses.

Arco (1997) compared several procedures for teaching university students to conduct DTT with children with autism. The training package included: (a) oral and written instruction on instructor performance (process) and child outcome performance (outcome), and (b) feedback. The feedback component included: (a) description and praise of correct trainee responses, (b) description of errors and of correct alternative responses, (c) a "feedback docket" (a performance summary sheet), and (d) feedback through graphing of child performance. Arco (1997) compared the process feedback training strategy (i.e., trainee performance) and the outcome feedback strategy (i.e., client-learner performance) with dockets and graphed outcome data, to feedback alone (i.e., praise). He concluded that feedback alone had similar effects on performance of trainees and client outcomes, suggesting that the more cost-effective feedback-alone procedure might be preferred. A limitation of Arco's study is that, during a discrete-trial, only four components (i.e., verbal instruction, prompts, the child's response, and the presentation of consequences) were each scored as either correct or incorrect. As indicated previously (and will be described in detail later), the present study involved a more complex DTT procedure, with prompting and prompt fading, error preclusion and error correction strategies.

Sarokoff and Sturmey (2004) reported the implementation of a behavioural skills training package to train staff to conduct DTT. They trained 3 instructors to teach one child with autism to match pictures or objects. Their DTT procedure had 10 components (i.e., participants' responses): (a) making eye contact with the child while delivering instructions, (b) waiting until the child showed readiness before issuing instructions, (c) using clear articulation while giving

the instruction, (d) using the correct instruction, (e) giving the instruction only once, (f) implementing a correction procedure, (g) providing appropriate immediate reinforcement for correct responses, (h) using behaviour-specific praise, (i) recording data following each trial, and (j) placing a 5-seconds inter-trial interval between trials. The independent variable included: (a) a written copy of the procedure with each component being reviewed by the experimenter before the training session, (b) visual feedback through use of a graph depicting the participant's baseline performance, (c) verbal feedback about the participant's performance in baseline (i.e., average score), (d) practice of 3 trials with the child, (e) feedback by the experimenter (i.e., positive comments on correct responses and "informative" feedback on components implemented incorrectly), (f) demonstration by the experimenter of 3 trials, and repetition of (d) and (f) for 10 minutes. The participant's performance was then scored on 10 trials following training. Criterion for completing the training was defined as achieving 90% accuracy on 3 consecutive training sessions. Finally, a post-training phase was conducted, where the teacher performed 10 trials with the child. In a multiple-baseline design across the 3 participants, results indicated a large improvement in percent accuracy following training. A limitation of this study is that the teachers were only trained to teach one task to the child, and generalization to teaching new tasks was not assessed. Also, given the many components of the training, it is not possible to determine which component(s) was/were responsible for the improvement in the teachers' performance. This is an important factor in evaluating the cost-effectiveness of a training procedure. Finally, the correction procedure was not detailed in the article.

Ryan and Hemmes (2005) used: (a) instruction (in-vivo, written, and videotaped), (b) demonstration, (c) role-playing, (d) practice, and (e) feedback, to train 3 special education instructors to conduct DTT with children with autism. The written instruction component was a

training manual, which contained information on topics beyond DTT (e.g., autism, intensive behavioural intervention, professional behaviour, and service delivery). The information was also discussed in the first phase of the training, in a small workshop with (a) lecture, (b) role-playing, and (c) demonstration. A quiz was administered and this "training" continued until participants scored 100% on 20 written and oral questions and demonstrations, which were not specified and for which data were not presented. Twelve components of DTT were identified, including: (a) identifying target responses in a distraction-free environment, (b) presenting materials, (c) establishing appropriate attending by the child, (d) presenting clear, brief, correct instructions, (e) using differential voice tones (e.g., enthusiastic versus neutral), (f) allowing correct time for the child to respond, (g) using behaviour-specific praise statements, (h) providing contingent reinforcement, (i) prompting within 5 seconds of a failure to respond by the child or immediately upon an incorrect response (i.e., correction procedure), (j) providing up to 5 seconds of inter-trial interval, (k) adding incidental teaching responses, and (l) recording data following each response by the child. In this study the trainees' performance on DTT was only assessed during post-training. The trainees conducted teaching of one of 3 tasks (i.e., receptive language, expressive language, and nonverbal imitation) and the first 10 trials of each task were recorded. The experimenter provided feedback on the trainees' performances based on a videotape of the session, just before the next training session. Correct responses were praised and inaccurate responses were followed by a description of the expected correct response. Acknowledgement of the feedback by the trainees was requested, and trainees practiced additional trials while role-playing. Mean percentages of accurate responses were calculated during this phase, across 10 sessions. All three trainees had above 89% accuracy in all but one component of the teaching procedure, namely addition of incidental teaching. A major limitation

of this study is the design. There was no information on participants' performance in baseline or during training to be compared to the post-training performance. It was indicated that the trainees had to meet 100% accuracy on 20 oral quizzes and demonstrations, but no details were given about the demonstrations. Also, 25-35 teaching sessions, each lasting 1 to 2 hours, occurred, which is considerable. Another limitation is that calculating mean percentage of accuracy on the target responses may hide some weaknesses in some of the components. For example, one participant had less than 80% accuracy on the components of voice tones, praise, contingent reinforcer, and the correction procedure. In addition, incidental teaching responses were not learned by any of the three instructors. Finally, the training model seems complex and contained much more than the DTT responses targeted in the present study.

Leblanc et al. (2005) reported research of an "abbreviated performance feedback" strategy to train 3 assistant teachers to conduct DTT with clients with autism whom they were familiar with, but had not taught using DTT. Participants had also been trained on basic principles of behaviour. Although the authors named their training strategy "performance feedback", the training included the following components: (a) a checklist of the 10 components of the DTT procedure, which was reviewed by the experimenter before the first training session, and (b) feedback on trainees' performance while conducting blocks of 10 teaching trials. Feedback consisted of descriptive praise following correct responses by the trainees and a verbal statement describing the expected correct response, following incorrect responding by the trainees. During feedback sessions, the experimenter answered questions by the trainees. Mastery of the DTT procedure was defined as 90% accuracy across the 10 components while implementing the DTT procedure, on two consecutive teaching sessions. Feedback sessions lasted between 8 and 10 minutes. Follow-up data were collected 2, 4, 7, and 11 weeks after the

training. Results show a large improvement in the performance of all 3 trainees and maintenance of mastery levels at follow-up measures. The authors also assessed social validity, which indicated high acceptability of the training procedures by the trainees. One limitation of this study is that the participants could already implement some of the components of the DTT procedure correctly before the intervention. In addition, generalization to new tasks and new students was not assessed, and the students' learning performance was not tracked in order to assess if improvements in participants' teaching performance would correlate with improvements in students' learning performance.

Recently, Gilligan et al. (2007) reported on the training of 3 staff members working with students 4 to 12-years-old with autistic spectrum disorder. Their DTT procedure had 7 components: (a) using the exact phrase described in a written protocol, (b) using a clearly audible volume, (c) presenting praise plus a tangible item following correct responses emitted by the student between 3 and 5 seconds after the S^D, (d) implementing error correction within 3 to 5 seconds following incorrect responses by the student, (e) recording data after each trial, (f) ensuring an intertrial interval of at least 3 seconds; and (g) warning the student before removing the reinforcer and starting the next trial. During baseline and training, participants received written instruction about the DTT procedure, which contained information on: (a) the exact instruction to be delivered (S^D), (b) the necessary materials for teaching, (c) the number of stimuli to be displayed during a trial, (d) a tangible item to be used as a reinforcer, (e) attending behaviours to be expected from the students, (f) definitions of correct, incorrect, and no responses by the students, and (g) the correction procedure. During baseline, the participants received the written instructions, the experimenter reviewed them, and the trainees had the opportunity to ask questions. Trainees' DTT performance was assessed across 10 trials. During

the experimental phase, the experimenter provided feedback to the trainees following teaching of 10-trial blocks, by (a) presenting descriptive praise for components performed at 90% accuracy, and (b) for components not performed at 90% accuracy, identifying the error made, describing the correct implementation of the component, and "rehearsing" the correct implementation (it is unclear if the experimenter demonstrated the correct implementation of the procedure or had the trainee rehearse what the experimenter described, but likely the former). Feedback sessions lasted between 5 and 8 minutes. Results indicate a large increase in accuracy of DTT by all 3 participants, with one participant displaying already high (85%) accuracy in baseline. Follow-up data collected with one of the participants indicated maintenance of improved performance (94% accuracy). A limitation of this study is that the tasks in which the participants were trained has already been mastered by the students they taught, making the training situation different from that where teaching will be expected to occur. Therefore, performance of DTT of tasks that the students were not yet able to perform was not assessed. In addition, the authors did not describe the correction procedure trained, which might have included a number of additional trainee responses. Finally, treatment integrity and social validity were not assessed.

In summary, few studies have investigated procedures for training parents and tutors to conduct DTT with children with autism, and the few that have been reported have limitations. First, although interobserver reliability checks on the dependent measure were conducted in all of the reviewed studies, none included procedural integrity checks to ensure that the training procedures were carried out as described. Second, independent variables were described only briefly, making systematic replications difficult. Third, the duration of training was considerable; for example approximately 25 hours in the Koegel et al. (1977) study and an

estimated 30 hours in Ryan and Hemmes (2005). Given the great importance of instructor and parent training in ABA intervention for individuals with autism, more research is necessary. As there have been no published attempts to describe the field-testing of a self-instructional DTT manual, one of the goals of this research has been to field-test a self-instructional manual (see Appendix B) for possible use in the training of parents and tutors in the St Amant ABA Program. The manual includes introduction to the basic behavioural principles of positive reinforcement, extinction, and punishment; guidelines for managing antecedents and consequences for correct and incorrect responses during DTT; and guidelines for recording data during DTT.

Statement of the Problem

Two experiments were conducted to evaluate a training package for teaching individuals to implement a multi-component discrete-trials teaching (DTT) strategy to teach children with autism. In Experiment 1, I used a modified multiple-baseline design to evaluate the effects of the training package on the teaching performance of 5 university students while implementing the DTT procedure with a confederate role-playing a child with autism. I also evaluated, in an AB within-subject design, their performance after exposure to each of the training strategies; a) a Self-Instructional Manual and b) Feedback plus Demonstration. Experiment 2 was a systematic replication of Experiment 1, with 3 parents of children with autism and 3 elementary school staff serving children with special needs as participants; 2 teaching assistants, and one resource teacher. In both experiments the generalization of participants' DTT performance was assessed while teaching the confederate new tasks (G1), as well as teaching a child with autism (G2).

Experiment 1

Method

Participants and Setting

Participants were five second-year university students, two males and three females, who volunteered to participate. The intervention was conducted in a testing room at St Amant during Phases 1 through 5 (i.e., baseline, training, and generalization to new tasks). During Phase 6 (G2), generalization to teaching a child with autism was assessed in sessions conducted in the homes of the three children with autism who were volunteered by their parents to participate as recipients of DTT. The children were clients of the St Amant ABA Program Preschool Services. As described previously, the St Amant ABA Preschool Program is a home-based early intervention program in which one-on-one teaching sessions are conducted daily in the clients' homes.

Materials

Abbreviated instructions for three tasks (i.e., auditory-visual discrimination of pictures of common items, matching pictures, and motor imitation) and accompanying data sheets (see Appendix A) were provided to the participants during the Baseline. A 21-page self-instructional manual describing a 19-component DTT procedure, which was developed for this study, was provided to the participants (see Appendix B) in the second phase of the study. Paper and a pen were provided for participants to write answers to the study questions in the manual and to write the mastery test.

During teaching sessions, a participant sat at a table, and a second table located on his/her right side was used to place the teaching materials and reinforcers. Two chairs were used, one for the participant and one for the confederate who role-played a child with autism.

Teaching materials were one set of three pictures of common items used for Task 1 (see Appendix C), which was an auditory-visual discrimination of pictures of common items, and two sets of matching pictures were used for Task 2, which was a matching visual-visual matching task (see Appendix D). The pictures were kept in two zip-lock bags. Reinforcers were two food items stored in plastic food containers, and small toys. Sessions were videotaped using a digital video camera and a tripod. A TV was used to watch videotaped sessions as well as to show a participant's performance in one of the phases of the study.

Target Behaviours and Data Collection

A participant was asked to conduct brief simulated teaching sessions in which he/she role-played a tutor implementing the multi-component DTT package to teach a confederate who role-played a child with autism. In each session a participant attempted to teach 12 trials of one of three tasks mentioned previously. The confederate followed three scripts (see Appendix E) during role-playing sessions, one per task that a participant attempted to teach. All sessions were videotaped, and the target behaviours were scored from the videotapes as described below.

Implementation of the DTT package was task analyzed into 19 components. The 19 responses of a participant were organized within five clusters: before teaching trials; management of discriminative stimuli (S^Ds); prompting; management of consequences for correct responses; and implementation of a procedure following incorrect responses by the child.

The dependent variable in this study was the performance of the participants on the implementation of the 19 components of the DTT procedure while teaching three tasks, one task per session. A data sheet, referred to as the Trainer Data Sheet (see Figure 1), was developed and field-tested for recording and evaluating the performance of the participants during the

TRAINER DATA SHEET

Participant:	**Date:**
Confederate:	**Task:**
IOA Yes ❑ No ❑	**Attempt#:**

Phase: 1. Baseline 2 ❑
2. Post-Manual ❑
3. Feedback+Demo ❑
4. Generalization ❑

Coding: + indicates correct - indicates incorrect / indicates not-applicable

	Prompt Delay Steps (for scoring only)												
	Trials	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Before Starting Teaching Trials												
1	Determine current targets		/	/	/	/	/	/	/	/	/	/	/
2	Gather materials		/	/	/	/	/	/	/	/	/	/	/
3	Select effective reinforcer(s)		/	/	/	/	/	/	/	/	/	/	/
4	Record correct prompt delay step												
	Provide S^Ds												
5	Secure the child's attention												
6	Present stimulus(i)*												
7	Present instruction**												
	Provide Necessary Prompts												
8	Use graduated guidance												
9	Use correct prompt delay step												
	Provide Consequence for Correct Responses												
10	Praise and deliver reinforcer immediately												
11	Record data immediately/accurately												
	Provide Consequence for Incorrect Responses												
12	Block gently (or at least attempt)												
13	Remove eye contact and stimulus(i) for 2-sec												
14	Record the error immediately + accurately												
15	Re-present stimuli												
16	Re-present instruction												
17	Prompt immediately to guarantee correct response												
18	Praise only												
19	Record error correction immediately + accurately												
	For scoring only: +p, I, or E												
	Number of Steps (for recording only)												
	Number of Correct (for scoring only)												
	Number of Errors (for scoring only)												

***Stimulus(i):**	****Instruction:**
Matching: 3 pairs of pictures (3 pictures on the table)	**Matching**: "Match", "Can you match"
Motor Im: motor action	**Motor Im**:"Do this", "Do the same"
Pointing to named pictures: 3 pictures on table	**Pointing to named pictures**: "Show me""Point to""Where is""Find"

Figure 1. Trainer Data Sheet

simulated and generalization teaching sessions. On the Trainer Data Sheet, the responses of a participant were recorded by coding ✓ for correct responses, × for incorrect responses, and / for not applicable. For example, following a trial where the child emitted a correct response, the components to be implemented following an error were not applicable. For each participant, data were collected during a session on 12 consecutive trials during which a participant attempted to teach one of the three tasks to a confederate. Percentages of correct responses per session on applicable components or steps were calculated to determine mastery of the implementation of the DTT package. A criterion of ≥90% correct responses (i.e., accuracy) was used for mastery.

Experimental Design and Phases

A modified multiple-baseline design across 5 participants was used to evaluate the effects of the phases of the training package on participants' performance while implementing the 19 components of the DTT procedure. With the usual multiple-baseline design across participants, Baseline data are collected concurrently for several participants, and the intervention is introduced in a staggered fashion across participants. If Baseline data remain stable, and performance improves only following the introduction of the treatment, then this supports two conclusions: a) observed effects are likely due to the treatment and not due to some uncontrolled variable that may have occurred concurrently with the treatment, and b) repeated exposure to baseline conditions does not affect performance, at least in the same direction as the treatment.

With the modified multiple-baseline design that I used, I conducted three Baseline sessions with each of the five participants concurrently at the beginning of the study. Then, when the treatment was introduced for Participant 1, I concurrently conducted three additional

baseline sessions with Participant 2, but not with Participants 3, 4, and 5. When the treatment variable was introduced for Participant 2, I concurrently conducted three additional baseline sessions with Participant 3; when the treatment variable was introduced for Participant 3, I concurrently conducted three additional baseline sessions with Participant 4; when the treatment variable was introduced for Participant 4, I concurrently conducted three additional baseline sessions with Participant 5; and then treatment was subsequently introduced to Participant 5. Thus, this modified multiple-baseline, made necessary by the limited availability of the participants as well as confederates, provided one Baseline control condition concurrent with the introduction of treatment to a participant, with each of the first four participants. This modified design did not allow for the examination of the effects of repeated exposure to different numbers of baseline sessions, as all participants but Participant 1 received a total of 6 baseline sessions.

Comparison of the effects of Feedback plus Demonstrations in role-playing sessions, following the study of the Self-Instructional Manual, was done using an AB within-subject design with replication.

Phase 1: Baseline. In the first session, a participant was given 10 minutes to read the Abbreviated Instructions and a data sheet (see Appendix A) for teaching the first task, and then asked to conduct 12 teaching trials of that task to a confederate role-playing a child with autism. The participant was asked to let the experimenter know when he/she had finished. When a participant indicated having finished teaching the task, or 15 minutes had elapsed without progress (i.e., a few discrete trials not yet conducted, as frequently participants did not end a trial when the confederate was not responding; instead, they continued changing their instruction and the presentation of the materials) he/she was thanked. The same process was followed for the second task in the second session, and then for the third task in the third

session. Those three sessions were repeated a second time in the Baseline phase for Participants 2 through 5.

Task 1 was an auditory-visual discrimination task, where the correct antecedents by the participant were an instruction such as “show me the banana” and the presentation of three pictures of common items horizontally lined on the table. The response to be taught to the confederate role-playing the child with autism was pointing to the picture that was named on each trial. Task 2 was a visual identity matching task, where the correct antecedents by the participant were the presentation of three comparison pictures on the table, a sample picture handed to the confederate, and the instruction to “match”. The response to be taught to the confederate was taking the sample picture and placing it on top of the corresponding comparison on the table. Task 3 was a motor imitation task, where the correct antecedents by the participant were the simultaneous presentation of a motor action (e.g., clapping) and the instruction to “do this”. The response to be taught to the confederate was the imitation of the modeled action.

Materials needed to teach the tasks and items to be used as reinforcers were left on a table to the right of the participant. Two zip-lock bags containing the pictures needed for Task 1 and for Task 2 were provided to give the participant the opportunity to demonstrate correct implementation of one of the steps of the teaching package, namely selecting the appropriate stimuli according to the data sheet. Four items were available to be used as reinforcers, two toys and two edibles. The edibles were in two clear plastic food containers.

Phase 2. Self-Instructional Manual. Participants studied the self-instructional manual designed for this study (see Appendix B). The manual described three basic principles and procedures of applied behaviour analysis (i.e., positive reinforcement, extinction, and punishment), and the components of the DTT package (i.e., reinforcer selection, discrete-trials,

prompt delay, graduated guidance, positive reinforcement, extinction, blocking, and error correction).

The manual was divided into four sections for the purpose of mastering the material in four blocks of time. The allowed time for studying was based on the number of pages and the number of questions of the section. Section 1 was comprised of Chapter 1, and participants had 30 minutes to study; Section 2 was comprised of Chapter 2, and participants had 60 minutes to study; Section 3 was comprised of Chapters 3 and 4, and participants had 30 minutes to study; and Section 4 was comprised of Chapters 5 and 6, and participants had 30 minutes to study. A participant was instructed to answer each question in writing, as it was encountered in the manual, rather than waiting to answer all of the questions at the end of each section.

Following each study section, a participant was given unlimited time to complete a written test composed of 40% of the questions in that section, without looking at the manual or their previously written answers. In order to have a random selection of questions, a participant was asked to pick question numbers from a bag. Each participant answered five questions from Chapter 1, eight questions from Chapter 2, three questions from Chapter 3, and two questions each from Chapters 4, 5, and 6.

For each section, when a participant indicated that he/she had finished answering the test, I checked all the answers. If they were 100% correct, the participant was congratulated and asked to start studying the next section of the manual. When an answer was incorrect, I required the participant to re-study the corresponding section of the manual and answer that question again. I then checked the answer again and either asked the participant to re-study (i.e., if the answer was still incorrect), or praised the participant and asked him/her to start studying the next section of the manual.

After mastery of the self-instructional manual, the participant was reassessed on his/her ability to conduct simulated DTT sessions as described for the Baseline phase. However, a participant was allowed to use, as a reference, Chapter 7 of the manual, which consisted of a one-page summary of the DTT strategy with specific examples of instructions and materials for each task. Participants' post-manual DTT performance on the three tasks was scored as described previously, and if they did not score ≥90% while teaching each of the three tasks, then they proceeded to the next phase of the experiment. If they scored ≥90% while teaching each of the three tasks, then they proceeded to Phase 4.

Phase 3: Feedback plus Demonstration in Role-playing. If a participant did not demonstrate mastery (≥90% accuracy) of DTT while teaching any of the three tasks to the confederate in Phase 2, then in Phase 3 Feedback plus Demonstration was presented for only one of the tasks. As will be described later, Participants 1, 3, 4, and 5 received Feedback plus Demonstration of Task 1 (i.e. auditory-visual discrimination) and Participant 2 received Feedback plus Demonstration of Task 2 (i.e., visual identity matching) after achieving mastery of Task 1 and Task 3 (i.e., motor imitation) in Phase 2 (i.e., Self-Instructional Manual).

In preparation for the Feedback plus Demonstration session, I completed a Feedback Form (see Figure 2) based on the participant's performance on 12 trials of a task that he/she did not master during Phase 2. On the Feedback Form, a plus (+) was recorded to indicate that all responses on that component were correct. A minus (-) was recorded to indicate that all or most responses were on that component were incorrect, and a plus/minus (+/-) was recorded when a participant's response was partially correct or when responses were correct on most trials and incorrect on few or several trials.

In the Feedback Form, when a + was recorded for a component, the participant was

Discrete-Trials teaching Feedback Form

Components	+ or -	Feedback
Before Starting Teaching Trials		
1. Determine current targets		
2. Gather materials		
3. Select effective reinforcer(s)		
4. Record correct prompt delay		
Provide SDs		
5. Secure the child's attention		
6. Present stimulus(i)		
7. Present instruction		
Provide Necessary Prompts		
8. Use graduated guidance		
9. Use correct prompt delay step		
Provide Consequence for Correct Responses		
10. Praise and deliver reinforcer immediately		
11. Record data immediately/accurately		
Provide Consequence for Incorrect Responses		
12. Block gently (or at least attempt)		
13. Remove eye contact and stimulus(i) for 2-s		
14. Record the error accurately		
15. Re-present stimulus(i)		
16. Re-present instruction		
17. Prompt to guarantee correct response (max 4 sec)		
18. Praise non-enthusiastically / praise only		
19. Record error correction immediately and accurately		

Figure 2. Feedback Form

praised and a descriptive feedback of the correct response provided. For example, I might have said "You did a good job always guaranteeing that the child was attending before giving the instruction." On steps where a – was recorded, I indicated on the feedback form what was incorrect and described to the participant what he/she had done incorrectly and explained the correct implementation of that teaching component.

Where a +/- was recorded, I described what was correct and what was incorrect and if something was missed. I might have said, for example, "You did block the response correctly, but you did not remove eye contact when you should have removed eye contact for 2-3 seconds; you did remove the materials, re-present the materials and the instruction, prompted the response, but delivered an edible, when you should have praised only. " In addition, some steps of the procedure included more than one response; for example blocking neutrally included precluding completion of the error, and not providing any vocal feedback. If the participant blocked the incorrect response successfully but said "no," then a + / - was recorded.

After giving feedback on the participant's performance, the correct implementation of the DTT procedure was demonstrated to the participant with the confederate who role-played a child with autism. During demonstration trials, responses were narrated, for example "I will count to 3 and prompt on 4", just before demonstrating a Step 4 of the prompt delay. Each DTT component performed incorrectly by the participant was demonstrated three times. For example, if a participant had implemented Step 2 of the prompt delay procedure incorrectly, three trials where the prompt delay was 2 seconds were demonstrated. The participant was allowed to ask questions to clarify the correct implementation of each component, but questions were not prompted. During each of the 3 demonstration trials per component, other components were also demonstrated, by virtue of the discrete trial. For example, to demonstrate the correct prompt

delay step a trial started with setting up the materials on the table (component 6), then giving the instruction (component 7), then counting out loud the 2 seconds of the prompt delay (component 9) before implementing graduated guidance (component 8). This way, some components might have been demonstrated more than three times.

When the demonstration was completed, I asked the participant to attempt to teach the task on which Feedback plus Demonstration had been provided. The participant's performance was scored while he/she waited. As will be described later, four of the five participants required just one Feedback plus Demonstration session to achieve ≥90% accuracy on the targeted task. Those participants were praised and proceeded to Phase 4. Because Participant 5 did not did not score ≥90% while teaching the task after first Feedback plus Demonstration session, a second round of Feedback alone was provided, but the demonstration was not repeated. Participant 5 was then asked to attempt to teach the confederate that task again.

Phase 3Plus for Participant 5. Because Participant 5 still had not scored ≥90% after Feedback plus Demonstration, and additional Feedback, that Participant watched with the experimenter the videotape of her latest session (i.e., post Feedback plus Demonstration, and additional Feedback), while I briefly commented on each step while scoring. This phase therefore included the opportunity for Participant 5 to watch herself on videotape while I provided feedback. At the end of the scoring, the steps to be improved were briefly mentioned, and again the participant was asked to attempt to teach the task. Participant 5 then achieved mastery (≥90%), was praised, and proceeded to Phase 4.

Phase 4: Generalization to New Tasks (G1). Participants 1, 3, 4, and 5 were asked to attempt to teach the tasks (2 and 3) that had not been targeted for Feedback plus Demonstration to the confederate. This enabled the assessment of whether the improvement in DTT that

followed Feedback plus Demonstration was also demonstrated with the other tasks. Because Participant 2 had achieved mastery while teaching Task 1 and Task 3 in Phase 2 (i.e., Self-Instructional Manual), and Task 2 in Phase 3 (Feedback plus Demonstration), Phase 4 was not conducted with this participant.

Phase 5: Generalization to Teaching a Child With Autism (G2). When a participant achieved ≥80% accuracy of DTT of a task in the previous phases, his/her DTT performance was then assessed while teaching the tasks to a child with autism. Sessions were conducted in the child's home, with 3 different children between the ages of 2.5 years and 4.5 years, whose parents volunteered them to participate. One of the children had been participating in an ABA Program for less than one month, the other child had been participating in an ABA Program for approximately 6 months, and the third child had been participating in an ABA Program for approximately 2 years.

The teaching targets were modified for some children according to their current skill level as described by their ABA Consultant, to ensure that the tasks were not in their repertoire (i.e., mastered). For example, when a child had demonstrated generalized identity matching ability with pictures of common items, that child was taught to match a printed clock to a card that showed the corresponding written time. This guaranteed that all participants would be assessed in their DTT performance while teaching a task that was novel to the child they taught.

Interobserver Agreement

An observer and I practiced data collection using the Trainer Data Sheet (see Figure 1) while recording one tutor and one senior tutor from the St Amant ABA Program who had been videotaped while implementing the DTT procedure with a confederate role-playing a child with autism. The observer and I practiced until we achieved 90% agreement (computed as described

below). Then I independently scored each participant's performance from the videotape, using the Trainer Data Sheet. The observer independently scored between 29% and 42% of the sessions per participant in all phases. Our records were compared point-by-point on the 19 steps on the Trainer Data Sheet. The percentage of agreement for a participant during a session was calculated by dividing the number of agreements by the number of agreements plus disagreements in that session, and multiplying by 100% (Martin and Pear, 2007). Interobserver agreement averaged 97%, ranging from 89% to 100%.

Interobserver agreement was also evaluated on the checks of the participants' responses to the Self-Instructional Manual mastery tests. Agreement was 100% for all checks.

Treatment Integrity

Checklists with the expected responses by the experimenter for each phase of the study were created to assess treatment integrity (see Appendix F). An observer used those checklists to record my behaviour while conducting sessions. Treatment integrity data collected on 90% of all experimental sessions was 100%.

Treatment integrity data were also recorded during the Feedback plus Demonstration sessions, by having an observer record, on a copy of the Feedback Form (see Figure 2), whether I had delivered the feedback as prepared and as described previously. Treatment integrity during the Feedback plus Demonstration phase was 100% on all of Phase 3's sessions.

Finally, the observer also recorded data on the confederate while role-playing a child with autism to evaluate the extent to which the confederate followed the scripts (see Appendix E) prepared for each task. Treatment integrity data were collected on 30% to 33% for each participant, in all phases of the experiment that involved a confederate. The accuracy of confederate script following averaged 96% (range of 94% to 100%).

Social Validity

To assess social validity, a questionnaire (see Appendix G) was sent to participants upon completion of their participation in the study to evaluate goals, procedures, and effects of the study. The questionnaire instructed participants to rate 10 statements about the study; four related to the goals, two related to the procedures, and four related to the effects accomplished. Rating was from 1 to 5. A rating of 1 indicated "Disagree", a rating of 2 indicated "Somewhat disagree", a rating of 3 indicated "Neutral", a rating of 4 indicated "Somewhat agree", and a rating of 5 indicated "Agree" with each statement.

Results

Figure 3 shows the percentage correct performance of DTT of the five participants during all phases of the experiment. The overall mean accuracy during Baseline while teaching a confederate was 34% (range of 17% to 61%). Participant 1 averaged 35%, with a range of 25% to 41%; Participant 2 averaged 32%, with a range of 21% to 50%; Participant 3 averaged 44%, with a range of 20% to 61%; Participant 4 averaged 32%, with a range of 26% to 43%; and Participant 5 averaged 26%, with a range of 17% to 33%. Participants 2 and 3 showed some improvement from the first 3 data points of Baseline.

Following Baseline, the participants required an average of approximately 2.6 (range from 2.6 to 2.7 hours) to achieve mastery of the Self-Instructional Manual (Phase 2), which includes the time to take the mastery tests (40% of the study questions). After completing the Self-Instructional Manual phase (studying the self-instructional manual and passing the mastery tests), accuracy improved for all participants. The overall mean accuracy improved from 34% in Baseline to 66% (range of 45% to 97%). Comparing the mean performance accuracy in Baseline to the mean performance accuracy during the Self-Instructional Manual phase for each of the

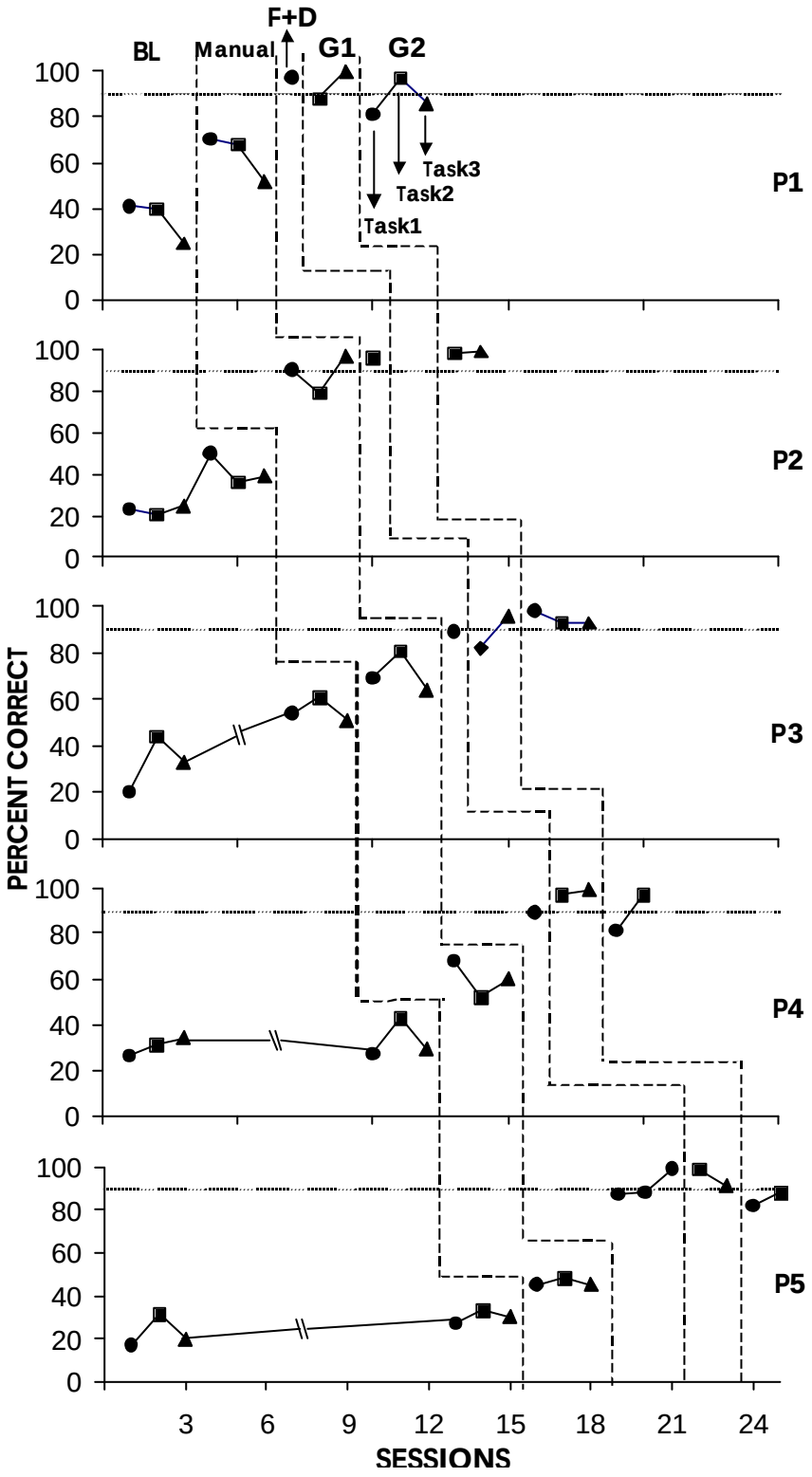


Figure 3. Percent of correct responses on the 19 components of the Trainer Data Sheet during Experiment 1. BL = Baseline; Manual = Self-Instructional Manual; F+D = Feedback plus Demonstration; G1 = Generalization across tasks; G2 = Generalization to teaching a child with autism; P= Participant.

a task (≥90%) during Phase 2, and only of 2 of the three tasks (Task 1 and Task 3).

Using the criterion for visual inspection of data from single-subject experiments described by Martin and Pear (2007), it appears that the improvement in performance was due to the Self-Instructional Manual (see Figure 3) condition with all participants but Participant 3. The increasing trend in accuracy during Baseline precludes the conclusion that, as with the other participants, this participant's performance was due to exposure to the Self-Instructional Manual. The Baseline performance of Participant 2 also warrants comment, as improvement was also seen in Baseline. However, visual inspection of the graphed performance of Participant 2 suggests that the Self-Instructional intervention was responsible for the improvement in performance from Baseline levels. This is based on the large and immediate increase in performance of Participant 2 from the last 3 data points in Baseline to the 3 data points in the Manual phase.

During Feedback plus Demonstration (Phase 3), after one treatment session of on average 30 minutes long, the overall mean accuracy of DTT was 92% (range of 87% to 97%), a 26% improvement from the Self-Instructional Manual phase, and a 58% improvement from the Baseline phase. Four of the 5 participants required only one session of Feedback plus Demonstration to achieve mastery (≥90%) of DTT of the task targeted for training (i.e., Task 1, auditory-visual discrimination, for Participants 1, 3, and 4; and Task 2, matching, for Participant 2 because this participant mastered Task 1 and Task 3 after completing the Self-Instructional Manual).

Participant 5 required three treatment sessions to achieve mastery (≥90%) of DTT of Task 1. This participant's accuracy was 87% after the first Feedback plus Demonstration session, and 88% after the second and after the third (feedback alone) additional sessions. This

participant then received the Feedback*Plus* session (i.e., watching self on videotape while I provided feedback), after which the accuracy on DTT of Task 1 improved to 99%.

The mean accuracy during the Feedback plus Demonstration phase, considering the additional sessions required for Participant 5, was 92% (range of 87% to 99%). The additional sessions required for Participant 5 to achieve mastery (≥90%) of DTT of Task 1 increased the overall Feedback plus Demonstration phase time to an average of approximately 35 minutes.

Generalization (G1) of DTT to tasks that were not targeted for Feedback plus Demonstration was assessed while Participants 1, 3, 4, and 5 taught the confederate Task 2 and Task 3. The mean accuracy during this Generalization phase was 94% (range of 82% to 100%). While teaching Tasks 2 and 3, Participant 1 scored 88% and 100%, Participant 3 scored 82% and 96%, Participant 4 scored 97% and 99%, and Participant 5 scored 99% and 91%. Thus, 2 participants achieved mastery (≥90%) of DTT of both Generalization tasks, and the other 2 participants achieved mastery (≥90%) of DTT of one of the Generalization tasks. Participant 2 had previously mastered DTT of all tasks and did not participate in this phase.

Generalization (G2) of DTT was also assessed while participants attempted to teach a child with autism. The mean accuracy during this Generalization phase was 91% (range of 81% to 99%). Participant 1 scored 81% on Task 1, 97% on Task 2, and 86% on Task 3. Participant 2 scored 98% on Task 1 and 99% on Task 2. Participant 3 scored 98% on Task 1, 93% on Task 2, and 93% on Task 3. Participant 4 scored 95% on Task 1 and 100% on Task 2. Participant 5 scored 82% on Task 1 and 88% on Task 2. Of the 12 sessions conducted to assess generalization to teaching a child with autism, all were above 80% accuracy, 9 were above 85%, and 7 were above 90%.

Social validity questionnaires were returned by four of the 5 participants. The maximum score possible across the four respondents was 200, if they all "Agreed" with all the statements. The agreement score obtained was 198, with two participants rating all 10 statements with a 5 ("Agree"), and two participants rating nine of the 10 statements with a 4 ("Somewhat agree), both on the statement evaluating the self-instructional manual: "The self-instructional manual to teach students to conduct discrete-trials teaching with children with autism was effective".

Experiment 2

Considering the positive results of Experiment 1 with the university students, Experiment 2 was designed to attempt to replicate the results of Experiment 1, with parents of children with autism and with staff members working with children with autism in an elementary school, and who had not previously received training in DTT.

Method

Participants and Setting

Participants were three parents (PAs) of children diagnosed with autism who had just enrolled in the St Amant ABA Program, but who had not yet received any training, and three staff members (TAs) who worked with children with autism in an elementary school (two teacher assistants and a resource teacher). They all volunteered to participate in the study. The sessions with the parents were conducted in a testing room at St Amant. Some of the sessions with the school staff were conducted in a room at St Amant and some sessions were conducted in the school where they worked.

Materials

Those were the same as in Experiment 1.

Target Behaviours and Data Collection

Those were the same as in Experiment 1.

Experimental Design and Phases

An ABC within-subject design was used to attempt to replicate the effects of the DTT package. A multiple-baseline design across participants was not possible with the parents because they had just enrolled their children in the St Amant ABA Preschool Program, and it was not ethically acceptable to delay training on DTT for some of them for research purposes. In addition, the school staff were only available for training on a few evenings and two weekends, and for practical reasons their training could not be staggered as would have been required for a multiple-baseline design across participants.

All phases of Experiment 2 were the same as described for Experiment 1, except for one variable of Phase 2 (i.e., Self-Instructional Manual); participants in Experiment 2 were given 60 minutes to study Chapter 1, which introduced behavioural principles and procedures (see Appendix B), instead of the 30 minutes given to the participants of Experiment 1. This was done because it was expected that the material in Chapter 1 would be potentially more difficult for the participants of Experiment 2, given the technical language and conceptual content of Chapter 1.

Interobserver Agreement, Treatment Integrity, and Social Validity

Interobserver agreement, treatment integrity, and social validity were also assessed as described for Experiment 1. Interobserver agreement data were collected on 33% to 36% of the sessions across the six participants, in all phases of the experiment, and averaged 97%, ranging from 92% to 100%. Interobserver agreement on the marking of the participants' responses to the mastery tests of the self-instructional manual was 98%. Treatment integrity data were collected on 90% of all experimental sessions, and was 100%. Script-following treatment integrity data

were recorded on 25% to 36% of sessions across the six participants, in all phases of the experiment that involved a confederate, and averaged 98%, ranging from 92% to 100%.

Results

Figure 4 shows the percentage correct performance of DTT during the phases of Experiment 2 for the school staff (TAs) and the parents (PAs). The mean accuracy across participants during Baseline while teaching a confederate was 34% (38% for the TAs and 29% for the PAs). TA1 averaged 30% (range of 29% to 31%); TA2 averaged 41% (range of 35% to 49%); and TA3 averaged 44%, (range of 36% to 50%). PA1 averaged 26% (range of 23% and 31%); PA2 averaged 36%, (range of 30% to 41%); PA3 averaged 25% (range of 24% to 26%). As expected, accuracy for all participants was lower during Baseline than during any other phase of the experiment, although TA2's Baseline performance was very similar to the performance after completing the Self-Instructional Manual (Phase 2).

Following Baseline, the participants required an average of approximately 3.1 hours (range from 2.8 to 3.2) to achieve mastery of the Self-Instructional Manual (Phase 2), including the time to take the mastery tests (40% of the study questions). After mastery of the Self-Instructional Manual, accuracy improved for all participants, although only slightly for TA2. The overall mean accuracy improved from 34% in Baseline to 57% (range of 35% to 75%) after completion of the Self-Instructional Manual (Phase 2), however none of the participants achieved mastery (≥90%) of DTT of a task.

Comparing the mean DTT performance accuracy in Baseline to the mean performance accuracy during the Self-Instructional Manual phase for each of the six participants, improvement was respectively from 30% to 65% (35% improvement), 41% to 47% (6% improvement), 44% to 58% (14% improvement), 26% to 39% (14% improvement), 36% to 70%

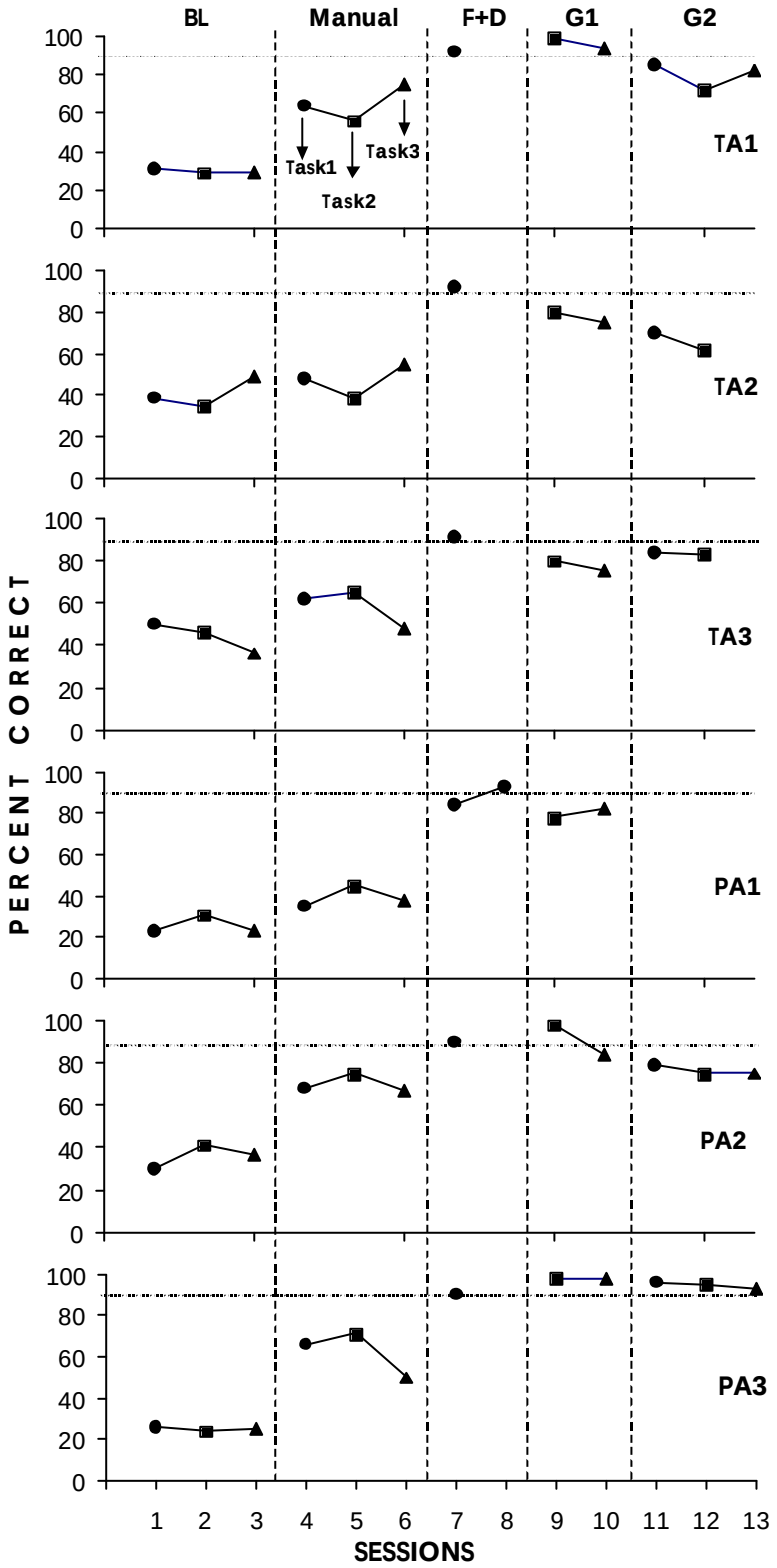


Figure 4. Percent of correct responses on the 19 components of the Trainer Data Sheet during Experiment 2. BL = Baseline; Manual = Self-Instructional Manual; F+D = Feedback plus Demonstration; G1 = Generalization across tasks; G2 = Generalization to teaching a child with autism; TA= Teaching assistant; PA= Parent.

(34% improvement), and 25% to 62% (37% improvement). Using the criterion of visual inspection of data from single-subject experiments described by Martin and Pear (2007), I conclude that the improvement in performance was due to the Self- Instructional Manual phase with all participants but TA2. The improvement of TA2 was small from Baseline to the Self-Instructional Manual; from 39% to 48% on Task 1, from 35% to 39% on Task 2, and from 49% to 55% on Task 3.

During Feedback plus Demonstration (Phase 3), after one treatment session of, on average, 30 minutes, the overall mean accuracy of DTT was 90% (range of 84% to 93%); 92% for the TAs and 89% for the PAs. This was a 33% improvement from the Self-Instructional Manual phase and a 56% improvement from the Baseline phase. Five of the 6 participants required only one session of Feedback plus Demonstration to achieve mastery (≥90%) of DTT of the task targeted for training (Task 1: auditory-visual discrimination).

PA1 required two treatment sessions to achieve mastery (≥90%) of DTT of Task 1, with accuracy of 84% after the first Feedback plus Demonstration session, and 93% after the additional (feedback alone) session.

The mean accuracy of the Feedback plus Demonstration phase, considering the additional session required for PA1 to achieve mastery of DTT of Task 1, remained at 90% (range of 84% to 93%). The additional session required for PA1 to achieve mastery (≥90%) of Task 1 increased the average duration of the Feedback plus Demonstration phase by approximately 35 minutes.

Generalization (G1) of DTT to tasks that were not targeted for Feedback plus Demonstration was assessed while the participants taught the confederate Task 2 and Task 3. The mean accuracy during this Generalization phase was 87% (range of 75% to 99%). While

teaching Tasks 2 and 3, accuracy was 99% and 94% for TA1, 80% and 75% for TA2, 80% and 75% for TA3. PA1 scored 78% and 82%, PA2 scored 98% and 84%, and PA3 scored 98% and 98%,). Thus, two participants (PA 3 and TA1) achieved mastery (≥90%) of DTT of both Generalization tasks, 1 participant (PA2) achieved mastery (≥90%) of DTT of Task 2, and 3 participants did not achieve mastery (≥90%) of DTT of the Generalization tasks. Nine of the 12 data points of this phase were above 80%, 10 were above 85%, and 5 were above 90%.

Generalization (G2) of DTT was also assessed while participants attempted to teach a child with autism. Sessions were attempted with all participants; however, PA1's performance could not be assessed because the child displayed uncooperative behaviours that precluded completion of the session. PA2 and PA3 conducted teaching of all three tasks with their respective children. The three TAs taught the same child with autism. TA2 and TA3 conducted DTT only of Task 1 and Task 2, because their performance was below 80% while teaching Task 3 to the confederate during the preceding phase (G1). The mean accuracy during this phase was 81% (range of 62% to 96%); 77% for the TAs and 86% for the PAs. TA1 scored 85% on Task 1, 72% on Task 2, and 82% on Task 3. TA2 scored 70% on Task 1 and 62% on Task 2. TA3 scored 84% on Task 1 and 83% on Task 2. PA2 scored 79% on Task 1, 75% on Task 2, and 75% on Task 3. PA3 scored 96% on Task 1, 95% on Task 2, and 93% on Tasks 3. Of the 13 sessions conducted to assess generalization to teaching a child with autism, 7 were above 80% accuracy, 4 were above 85%, and 7 were above 90%.

All participants returned the social validity questionnaires. The maximum score possible across the six respondents was 300, if they all "Agreed" with all the statements. The agreement score obtained was 290, with four participants rating all 10 statements with a 5 ("Agree"), and two participants rating nine of the 10 statements with a 5 ("Agree), and one statement with a 4

("Somewhat agree"), both on the statement evaluating procedures: "The self-instructional manual to teach students to conduct DTT with children with autism was effective".

Discussion

Few studies have investigated training strategies to train tutors and parents to conduct DTT with children with autism and to date none have investigated a self-instructional manual. Across both experiments, after an average of approximately 3 hours of studying and taking the mastery tests of the Self-Instructional Manual (Phase 2), DTT performance improved from a mean accuracy of 34% during Baseline to a mean accuracy of 61%. Results appeared to be due to exposure to the manual for 9 of the 11 participants. Across both experiments, following an average of approximately 35 minutes of exposure to the Feedback plus Demonstration of DTT of one teaching task, participants improved from a mean accuracy of 61% after the Self-Instructional Manual phase to a mean accuracy of 91% while teaching a confederate. The improvement appeared to be due to the intervention with 10 of the 11 participants. Nine of the 11 participants required only one treatment session of Feedback plus Demonstration to achieve mastery (≥90%) of DTT of the targeted task, for an average training time of approximately 30 minutes. One participant required two additional sessions of Feedback plus Demonstration to achieve mastery, and one participant required three additional training sessions. This participant's accuracy of DTT after one Feedback plus Demonstration session was 87%, and was 88% after the additional Feedback sessions, which is still quite good.

Generalization (G1) was assessed on tasks not targeted during Feedback plus Demonstration for 10 of the 11 participants and the mean accuracy was 90% (range of 75% to 100%). Four of the 4 university students, 1 of the 3 teaching assistants, and 2 of the 3 parents achieved an average accuracy of ≥90% while teaching new tasks to the confederate.

Generalization (G2) was also assessed with all of the participants except one of the parents, while they attempted to teach a child with autism. The mean accuracy for the 10 participants was 86% (range of 62% to 99%). Three of the 5 students, none of the 3 teaching assistants, and 1 of the 3 parents achieved an average accuracy of ≥90% while teaching the child with autism.

Overall, these results demonstrate that the training package has considerable potential for teaching DTT to tutors and parents of children with autism. Moreover, across both experiments, the total training time averaged approximately 3.4 hours per participant, which is considerably less than that reported by previous studies. Both experiments also had high social validity, high interobserver agreement, and high treatment integrity. An additional indicator of social validity is that two of the university students who participated in the study were subsequently hired as tutors to teach children with autism.

Several limitations of the two experiments should be mentioned. First, as indicated previously, the university students in Experiment 1 showed better generalization than the teaching assistants and parents in Experiment 2. It is not possible, from these experiments, to draw conclusions about the cause of this result. Second, the ABC design of Experiment 2 is not as strong as the multiple-baseline design of Experiment 1. Third, because of the AB design used within each experiment, it is not possible to assess if Feedback plus Demonstration when not preceded by the Self-Instructional Manual phase would be sufficient to improve DTT accuracy to the levels observed when the Self-Instructional Manual was implemented before Feedback plus Demonstration. Fourth, it is not possible to evaluate if feedback without demonstration, or demonstration without feedback, would have yielded the same outcomes. Fifth, neither experiment included follow-up data.

Future research might address several questions. First, would mastery of the content of a revised and improved self-instructional manual lead to mastery of DTT (≥90%) so that feedback plus demonstration is not needed? Second, if a demonstration phase is needed following the Self-Instructional Manual phase, could it be accomplished with a self-instructional videotape showing an experienced tutor conducting DTT? Future research should also address the different generalization results obtained in these experiments between the university students versus the teaching assistants and parents, and the lack of follow-up data in the current experiments.

In summary, across the two experiments: a) 9 of the 11 participants showed improvement in DTT while teaching a confederate (role-playing a child with autism) after studying the Self-Instructional Manual phase, although only one participant achieved mastery criterion (≥90%); b) Participant 2 in Experiment 1 achieved mastery of DTT after the Self-Instructional Manual phase, and 9 of the remaining 10 participants achieved mastery of DTT after the Self-Instructional Manual phase plus receiving only one session of Feedback plus Demonstration, which required an average total training time of approximately 3.4 hours per participant; and c) after mastering DTT of one task with a confederate role-playing a child with autism, 8 of the 10 participants (one was not assessed) averaged ≥90% accuracy of DTT of additional tasks with the confederate, and 4 of the 10 participants (one was not assessed) averaged ≥90% accuracy for teaching the tasks to a child with autism. Eight of the 11 participants (one was not assessed) averaged ≥80% on both generalization conditions. These results suggest that, with modest modifications, the training package has considerable potential as an even more economical approach for training university students, tutors, and parents of children with autism to conduct DTT.

References

Alpert, C. L. and Kaiser, A. P. (1992). Training parents as milieu language teachers. *Journal of Early Intervention*, 16, 1, 31-52.

Arco, Lucius. (1997). Improving program outcome with process-based performance feedback. *Journal of Organizational Behavior Management*, 17, 1, 37-28.

Ducharme, J. M., and Drain, T. (2004). Treatment and generalization effect of errorless academic compliance training for children with autism. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43, 163-171.

Ducharme, J. M., and Feldman, (1992). Comparison of staff training strategies to promote generalized teaching skills. *Journal of Applied Behavior Analysis*, 25, 1, 165-179.

Ducharme, J. M., Popynick, M., Pontes, E., and Steele, S. (1996). Errorless compliance to parental requests III: Group parent training with parent observational data and long-term follow-up. *Behavior Therapy*, 27, 353-372.

Ducharme, J. M., Sanjuan, E., and Drain, T. (2007). Errorless compliance training: Success-focused behavioural treatment of children with Asperger Syndrome. *Behavior Modification*, 31, 329-344.

Ducharme, J. M., Williams, L., Cummings, A., Murray, P., and Spencer, T. (2001). General case quasi-pyramidal staff training to promote generalization of teaching skills in supervisory and direct-care staff. *Behavior Modification*, 25, 2, 233-254.

Gilligan, K. T., Luiselli, J. K., and Pace, G. M. (2007). Training paraprofessional staff to implement discrete-trial instruction: evaluation of a practical performance feedback intervention. *The Behavior Therapist*, 30, 63-66.

Greene, L., Kamps, D., Wyble, J., and Ellis, C. (1999). Home-based consultation for parents of

young children with behavioral problems. *Child and Family Behavior Therapy*, 12, 2, 19-45.

Handleman, J. S. and Harris, S. L. (2001). *Preschool education programs for children with autism, 2nd edition*. Austin, TX: PRO-ED.

Harris, S. L., Handleman, J. S., Arnold, M. S., and Gordon, R. F. (2001). The Douglass Developmental Disabilities Center: Two Models of Service Delivery. In: *Preschool Education Programs for Children With Autism* (233-260), Handleman, J. S. and Harris, S. L. (Eds.). Austin, TX: PRO-ED.

Howard J.S., Sparkman CR, Cohen H.G., Green G, Stanislaw H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research on Developmental Disabilities*, 26, 4, 359-383.

Hughes, T. A., Fredrick, L. D., and Keel, M. C. (2002). Learning to effectively implement constant time delay procedures to teach spelling. *Learning Disability Quarterly*, 25, 209-220.

Koegel, R. L., Glahn, T. J., and Nieminen, G. S. (1978). Generalization of parent-training results. *Journal of Applied Behavior Analysis*, 11, 1, 95-109.

Koegel, R. L., Russo, D. C., and Rincover, A. (1977). Assessing and training teachers in the generalized use of behavior modification with autistic children. *Journal of Applied Behavior Analysis*, 10, 197-205.

Krumhus, K. M. and Malott, R. W. (1980). The effects of modeling and immediate and delayed feedback in staff training. *Journal of Organizational Behavior Management*, 2, 4, 279-293.

Lavie, T. and Sturmey, P. (2002). Training staff to conduct a paired-stimulus preference

assessment. *Journal of Applied Behavior Analysis*, 35, 2, 209-211.

Leblanc, M. P, Ricciardi, J. N., and Luiselli, J. K. (2005). Improving discrete trial instruction in paraprofessional staff through an abbreviated performance feedback intervention. *Education and Treatment of Children*, 28, 76-82

Lerman, D. C., Swiezy, N., Perkins-Parks, S., and Roane, H. S. (2000). Skill acquisition in parents of children with developmental disabilities: Interaction between skill type and instructional format. *Research in Developmental Disabilities*, 21, 183-196.

Lovaas, O. I, Smith, T., and McEachin, J. J. (1989). Clarifying comments on the young autism study: Reply to Schopler, Short, and Mesibov. *Journal of Consultational Clinical Psychology*, 57, 1, 165-167.

Lovaas, O. I. (1981). *Teaching developmentally disabled children: The Me Book.* Austin, TX: PRO-ED.

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 1, 3-9.

Lovaas, O. I. (2002). *Teaching Individuals With Developmental Delays: Basic Intervention Techniques.* Austin, TX: PRO-ED.

Malott, R. W. (2005). A brief history of behavior analysis and autism. Retrieved from http://dick-malott.com/autism/articles.html

Marcus, B. A., Swanson, V., and Vollmer, T. R. (2001). Effects of parent training on parent and child behavior using procedures based on functional analyses. *Behavioral Interventions*, 16, 87-104.

Martin, G. L. and Pear, J. (2007). Behavior Modification: What it is and How to Do it. Prentice Hall, Upper Saddle River, NJ.

Maurice, C, Green, G., and Luce S. (1996). *Behavioral intervention for young children with autism: A manual for parents and professionals*. Austin, TX: PRO-ED.

Maurice, C., Green, G., and Foxx, R. M. (2001). Making a difference: Behavioral intervention for autism. Austin, TX: PRO-ED.

McEachin, J., J., Smith, T., and Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation*, 94, 4, 359-372.

McGee, G. G., Morrier, M. J., and Daly, T. (2001). The Walden Early Childhood Programs. In: *Preschool Education Programs for Children With Autism* (157-190), Handleman, J. S. and Harris, S. L. (Eds.). Austin, TX: PRO-ED.

Meyer, L. S., Taylor, B. A., Levin, L., and Fisher, J. R. (2001). Alpine Learning Group. In: *Preschool Education Programs for Children With Autism* (135-155), Handleman, J. S. and Harris, S. L. (Eds.). Austin, TX: PRO-ED.

Moore, J. W., Edwards, R. P., Sterling-Turner, H., Riley, J., DuBard, M., and Mcgeorge, A. (2002). Teacher acquisition of functional analysis methodology. *Journal of Applied Behavior Analysis*, 35, 1, 73-77.

New York State Department of Health Early Intervention Program (1999). Clinical Practice Guideline: Report of the Recommendations, Autism/Pervasive Developmental Disorders, Assessment and Intervention for Young Children. Publication #4215. Health Education Services, P.O. Box 7126, Albany, NY 12224. http://www.health.state.ny.us/nysdoh/eip/menu.htm

Parsons, M. B., Reid, D. H., and Green, C. W. (1996). Training basic teaching skills to community and institutional support staff for people with severe disabilities: A one-day

program. *Research on Developmental Disabilities*, 17, 6, 467485.

Realon, L. E., Lewalle, J. D., and Wheeler, A. J. (1983). Verbal feedback vs. verbal feedback plus praise: the effects on direct care staff's training behaviors. Mental Retardation, 21, 5, 209-212.

Reid, D. H., Parsons, M., Lattimore, P., Towery, D. L., and Reade, K. K. (2005). Improving staff performance through clinician application of outcome management. *Research on Developmental Disabilities*, 26, 101-116.

Romanczyck, R. G., Lockshin, S. B., and Matey, L. (2001). The Children's Unit for Treatment and Evaluation. In: *Preschool Education Programs for Children With Autism* (49-94), Handleman, J. S. and Harris, S. L. (Eds.). Austin, TX: PRO-ED.

Ryan, C. S. and Hemmes, N. S. (2005). Post-discrete-trial teaching performance by instructors of young children with autism in early intensive behavioral intervention. *The Behavior Analyst Today*, 6, 1, 1-12.

Sarokoff, R. A. and Sturmey, P. (2004). The effects of behavioral skills training on staff implementation of discrete-trial teaching. *Journal of Applied Behavior Analysis*, 37, 4, 535-538.

Schepis, M. M., Reid, D. H., Ownbey, J., and Parsons, M. B. (2001). Training support staff to embed teaching within natural routines of young children with disabilities in an inclusive preschool. *Journal of Applied Behavior Analysis*, 34, 3, 313-327.

Smith, T. (2001). Discrete Trial Training in the Treatment of Autism. *Focus on Autism and Developmental Disabilities*, 16, 2, 86-82.

Sundberg, M. L. and Partington, J. W. (1998). *Teaching language to children with autism and other developmental disabilities*. Danville, CA: Behavior Analysis.

U.S. Department of Health and Human Services. 1999. *Mental Health: A Report of the Surgeon General*. U.S. Department of Health and Human Services: Rockville, MD.

Wallace, M. D., Doney, J. K., Mintz-Resudek, M., and Tarbox, R. S. F. (2004). Training educators to implement functional analyses. *Journal of Applied Behavior Analysis*, 37, 1, 89-92.

Weiss, M. J. and Piccolo, E. (2001). The Rutdgers Autism Program. In: *Preschool Education Programs for Children With Autism* (13-27), Handleman, J. S. and Harris, S. L. (Eds.). Austin, TX: PRO-ED.

Appendix A. Abbreviated Instructions and Accompanying Data Sheets

Abbreviated Instructions for Teaching Children with Autism to Point to Pictures When Named (Auditory-Visual Discriminations) Using Discrete-Trials Teaching

- For this task you will role-play a tutor who is attempting to teach a child with autism who has minimal language skills. Do your best at providing what you think would be appropriate instructions, prompts or cues, and consequences while attempting to teach the "child", based on the guidelines listed below.
- Here are three pictures. Your task is to teach this person (who will be role-playing a child with autism) to point to the correct picture after you place the three pictures on the table and name one of them. Across trials, try to teach the "child" to point to all 3 pictures when they are named.
- After each response by the "child", record on the attached Data Sheet if the "child" responded correctly independently, responded correctly with prompts or cues, or made an error. Place a checkmark like this ✓ in the appropriate column.

Summary of Steps

1. Arrange necessary materials.
2. Decide what you will use as consequences for correct responses and consequences for incorrect responses
3. On each trial:
    a. Secure the child's attention.
    b. Present the correct materials
    c. Present the correct instruction.
    d. Provide whatever extra help (i.e., prompts or cues) you think are necessary for the child to respond correctly.
    e. Once the "child: responds, provide what you consider to be an appropriate feedback or reward for a correct response, or provide an appropriate reaction for an error
    f. Across trials gradually provide less and less prompts or cues (i.e., fade out the extra prompts)
        i. By prompting less
        ii. By delaying your prompts
    g. Continue in this manner until you have conducted 12 teaching trials. Record the results below.

Participant #: _____ Confederate: _____
Baseline ☐
Post-Manual ☐
Demo Task 1 2 3 ☐ Attempt#: _____
Generalization ☐

POINTING TO NAMED PICTURES

(Auditory-Visual Discrimination)

Date: _____

Teacher: _____

Targets: Banana

Dog

Balloons

Record ✓ in the appropriate column for each trial

Trials	Prompt Delay Step	Correct Independent	Correct Prompted	Error	Correct on Error Correction
1. Banana					
2. Balloons					
3. Banana					
4. Dog					
5. Balloons					
6. Dog					
7. Banana					
8. Balloons					
9. Balloons					
10. Dog					
11. Banana					
12. Dog					

Abbreviated Instructions
for Teaching Children with Autism to Match Pictures Using Discrete-Trials Teaching

- For this task you will role-play a tutor who is attempting to teach a child with autism who has minimal language skills. Do your best at providing what you think would be appropriate instructions, prompts or cues, and consequences while attempting to teach the child, based on the guidelines listed below.
- Here are three pictures. Your task is to teach this person (who will be role-playing a child with autism) to place a card on top of the identical card presented on the table when you say "Match" and give him/her a picture. Across trials, try to teach the "child" to match the three pictures.
- After each response by the "child", record on the attached Data Sheet if the "child" responded correctly independently, responded correctly with prompts or cues, or made an error. Place a checkmark like this ✓ in the appropriate column.

Summary of Steps

1. Arrange necessary materials.
2. Decide what you will use as consequences for correct responses and consequences for incorrect responses
3. On each trial:
    a. Secure the child's attention.
    b. Present the correct materials
    c. Present the correct instruction.
    d. Provide whatever extra help (i.e., prompts or cues) you think are necessary for the child to respond correctly.
    e. Once the "child: responds, provide what you consider to be an appropriate feedback or reward for a correct response, or provide an appropriate reaction for an error
    f. Across trials gradually provide less and less prompts or cues (i.e., fade out the extra prompts)
        i. By prompting less
        ii. By delaying your prompts
    g. Continue in this manner until you have conducted 12 teaching trials. Record the results below.

Participant #: _____ Confederate: _____
Baseline ☐
Post-Manual ☐
Demo Task 1 2 3 ☐ Attempt#: _____
Generalization ☐

MATCHING

Date: _____

Teacher: _____

Targets: House

Tree

Cat

Record ✓ in the appropriate column for each trial

Trials	Prompt Delay Step	Correct Independent	Correct Prompted	Error	Correct on Error Correction
1. House					
2. House					
3. Cat					
4. Tree					
5. Cat					
6. House					
7. Tree					
8. Tree					
9. House					
10. Cat					
11. Cat					
12. Tree					

Abbreviated Instructions
for Teaching Children with Autism to Imitate Simple Actions
Using Discrete-Trials Teaching

- For this task you will role-play a tutor who is attempting to teach a child with autism who has minimal language skills. Do your best at providing what you think would be appropriate instructions, prompts or cues, and consequences while attempting to teach the child, based on the guidelines listed below.
- Your task is to teach this person (who will be role-playing a child with autism) to imitate some actions you will present using your arms and hands, immediately after you present the action. The actions are: clapping, raising both arms (arms up), and placing one hand on top of the other on the lap. Across trials, try to teach the "child" to imitate the three actions.
- After each response by the "child", record on the attached Data Sheet if the "child" responded correctly independently, responded correctly with prompts or cues, or made an error. Place a checkmark like this ✓ in the appropriate column.

Summary of Steps

1. Arrange necessary materials.
2. Decide what you will use as consequences for correct responses and consequences for incorrect responses
3. On each trial:
    a. Secure the child's attention.
    b. Present the correct materials
    c. Present the correct instruction.
    d. Provide whatever extra help (i.e., prompts or cues) you think are necessary for the child to respond correctly.
    e. Once the "child: responds, provide what you consider to be an appropriate feedback or reward for a correct response, or provide an appropriate reaction for an error
    f. Across trials gradually provide less and less prompts or cues (i.e., fade out the extra prompts)
        i. By prompting less
        ii. By delaying your prompts
    g. Continue in this manner until you have conducted 12 teaching trials. Record the results below.

Participant #: _____ Confederate: _____
Baseline ☐
Post-Manual ☐
Demo Task 1 2 3 ☐ Attempt#: _____
Generalization ☐

MOTOR IMITATION

Date: _____

Teacher: _____

Targets: Clap

Arms up

Hands ready = hand on hand on lap

Record ✓ in the appropriate column for each trial

Trials	Prompt Delay Step	Correct Independent	Correct Prompted	Error	Correct on Error Correction
1. Arms up					
2. Arms up					
3. Hands ready					
4. Clap					
5. Hands ready					
6. Hands ready					
7. Clap					
8. Arms up					
9. Clap					
10. Arms up					
11. Hands ready					
12. Clap					

Appendix B. Self-Instructional Manual

Using Discrete-Trials Teaching to Teach Children with Autism: An Introduction

Daniela Fazzio and Garry Martin

October 2006

Copyright © by Daniela Fazzio and Garry Martin

All Rights Reserved

The reproduction of this work in any form or by any electronic, mechanical, or other means, is forbidden without the prior written permission of one of the authors.

Table of Contents

Chapter 1
Introduction

This manual contains descriptions and examples of some of the concepts and basic skills you will need in order to successfully conduct teaching trials with children with Autism using the St. Amant Preschool Applied Behavior Analysis (ABA) Teaching Program. The approach that you will be learning is referred to as discrete-trials teaching. It is important to note that this approach is only one teaching method, and you will also learn to teach using other behavioral techniques. Before learning about components of the ABA teaching program however, you need to learn some basic terms used by applied behavior analysts.

In order to work in the St. Amant ABA Teaching Program, you need to be very familiar with the concepts and procedures described in this manual. To help you to master them, we have provided study questions at the end of each sub-section. When studying this manual, you should proceed as follows: first, read a sub-section; second, figure out how to answer the study questions at the end of that sub-section; third, memorize the answers to the study questions; then proceed to the next sub-section. At a later date, you will be given a closed-book test to assess your mastery of the study questions.

BEHAVIOR AND STIMULI

In general terms, **behavior** is anything that a person says or does. Some commonly used synonyms include: “activity”, “action”, “performance”, “responding”, and “response”. Thus, blinking is a behavior while the color of your eyes is not a behavior. To take another example, putting on a shirt is a behavior, the color of the shirt is not a behavior. We learn to behave in response to our immediate environment. When the traffic light turns green you proceed through the intersection, when the light turns red, you stop. The things (sights, sounds, smells, etc.) in our environment capable of affecting our behavior are called **stimuli** (plural of **stimulus**). In the above examples, the red light, the green light, the color of your eyes and the color of a shirt are stimuli.

Study Questions
1. Define behavior and give two examples.
2. Define stimuli and give two examples.

BEHAVIORAL PRINCIPLES INVOLVING CONSEQUENCES

Let’s now take a look at how stimuli and behavior are involved in basic behavioral principles. We have evolved over thousands of years so that many of our behaviors are affected by their immediate consequences. In everyday language, we say that rewards strengthen behavior

that they follow, and punishers weaken behavior that they follow. Behavior analysts have studied how consequences affect behavior in thousands of experiments and have formulated their findings into basic behavioral principles. We will consider three such principles.

Positive Reinforcement

A **positive reinforcer** is a stimulus that, when presented immediately following a behavior, causes the behavior to be strengthened (or be more likely to re-occur). In general terms, positive reinforcers are things that individuals like. Candy, for example, is a reinforcer for most children. Affectionate pats and hugs, praise, nods and smiles (referred to as social reinforcers) are reinforcers for most individuals. The principle called **positive reinforcement** states that the presentation of a reinforcer immediately following a response strengthens that response. So what is the difference between a positive reinforcer and the principle of positive reinforcement? A positive reinforcer is a *thing* (e.g., a candy, a hug, or praise) while positive reinforcement (like all behavioral principles) includes a procedure and a result. The procedure is presenting a reinforcer after a response; the result is that the response is strengthened.

Study Questions
3. Define positive reinforcer and give an example.
4. What is the difference between a positive reinforcer and the principle of positive reinforcement?

Extinction

Suppose that each time a child whines while asking for something, a parent gives the child what the child asked for. In this example, the behavior of whining has been positively reinforced by receipt of things asked for, and the behavior of whining will have been strengthened. Now suppose that the parent decides that he/she will no longer give the child what the child asks for if the child is whining. After several instances in which whining no longer pays off, the child is less likely to whine when asking for things. This example illustrates the **principle of extinction**. Like positive reinforcement, extinction involves a procedure and a result. The procedure of extinction is withholding a reinforcer following a previously reinforced response. The result is that the response is weakened. When a behavior no longer occurs because of several applications of the extinction procedure, we say that the behavior has extinguished. Of course, a behavior is not likely to be extinguished after just one trial of the extinction procedure.

Study Questions
5. Describe the two parts to the principle of extinction.
6. Describe an example of extinction (include the procedure and the result in your description).

Punishment

A **punisher** is a stimulus that, when presented immediately following a behavior, causes the behavior to be weakened (or less likely to occur). Suppose, for example, that a child is fiddling with the remote control for the TV set and a parent immediately shouts “No!” and roughly takes the remote control away from the child. The child is less likely to play with the

remote control in the future. Like the principles of positive reinforcement and extinction, the **principle of punishment** has both a procedure and a result. The procedure is the presentation of a punisher immediately following a response; the result is that the individual is less likely to emit that response again. Different types of stimuli can function as punishers. We are all familiar with physical punishers such as loud sounds, or spankings. Reprimands can also function as punishers. Loss of privileges immediately following a response is another type of punisher. Also note that both extinction and punishment can lead to a decrease in behavior but the cause of the decrease is different with the two principles. With extinction, a behavior decreases because instances of the behavior are no longer followed by a reinforcer. With punishment, a behavior decreases because it is immediately followed by a punisher. While it is important that you know about the principle of punishment, it is not something that you will be asked to apply in the ABA teaching program.

Study Questions

7. Define punisher and give an example.
8. Suppose that, immediately after an instance of yelling by a child, a teacher takes away a toy that the child had previously earned and the result is that yelling decreases. Is this an example of extinction or punishment?

A BEHAVIORAL CONTINGENCY

When we teach children with Autism, we analyze each teaching trial into 3 components: (a) the conditions that exist just before the child responds or performs, called antecedent conditions; (b) the response or behavior of the child; (c) and the immediate consequences of the child's response. When a child responds appropriately to an antecedent, and receives a consequence, we say that the consequence is contingent upon the response. Thus, on any given teaching trial, the antecedents, response, and immediate consequences are referred to as a behavioral contingency. We can consider most behaviors in these terms.

An Example of a Behavioral Contingency

Suppose that a teacher sits across the table from Anna, the student. On a teaching trial, the teacher presents a box and a can on the table in front of Anna and says, "Box". The response by Anna is to point to the box. The teacher says, "correct," and gives Anna a piece of candy. Can you identify the antecedents, response, and consequences in this example? The antecedents, behavior, and consequences (ABCs) of a contingency are sometimes diagrammed as follows:

Antecedent (A)	⇨	**Behavior (B)**	⇨	**Consequence (C)**
Box and Can on table; Teacher says "Box"		Anna points to box		Teacher says "correct" and gives candy to to Anna

Study Question

9. What is a behavioral contingency? Describe an example.

A DISCRETE-TRIALS TEACHING PROCEDURE

In a discrete-trials procedure, the teacher presents an antecedent, waits for the child to respond, and then provides an immediate consequence, and repeats these steps many times. In other words, the opportunity for the child to respond depends on the teacher's presentation of the antecedent. Thus, with this procedure, the rate at which a child can respond depends on the rate at which the teacher presents antecedents. You can see that an instance of a discrete-trial is a behavioral contingency, and it includes the same three components: antecedent, response, and consequence.

An Example

In the example described above with Anna and the teacher, the teacher presented 3 items to Anna and said "ball". Anna pointed to the ball, and the teacher said, "correct" and gave Anna a piece of candy. That was an example of a discrete-trial. The antecedents were the physical stimuli/materials combined with the vocal stimulus "ball" said by the teacher. The response by Anna was pointing, and the teacher's consequences were praise, ("correct") and an edible (candy).

Non-Example

Suppose that the teacher and Anna are in a room with a lot of toys on the floor, along with an empty toy box. Anna, on her own, begins to pick up the toys and put them in the toy box. Suppose that each time Anna does so, the teacher says, "good for you". In this example, Anna can pick up the toys slowly or rapidly. Her rate of response is not restricted to the rate at which the teacher presents prompts because the teacher has not presented any prompts. Therefore, this is not a discrete trial. Consider another example. Suppose that Anna is running around the room and she sees a ball and says "ball." The teacher responds, "Good Anna, do you want to play with it?" Once again, this is not a discrete-trial because Anna responded without the teacher providing an antecedent.

As you can see by the above examples, some teaching situations involve discrete-trials, and some do not. In the rest of this manual, we will discuss the components of discrete-trials teaching in more detail.

Study Questions

10. Briefly describe the components of a discrete-trials teaching procedure.
11. Describe an example of a discrete trial.
12. Describe an example of a task assigned to a child that would not be considered a discrete-trial.
13. Is a single discrete-trial essentially the same thing as an instance of a behavioral contingency? Justify your answer.

Chapter 2
Managing Antecedents During Discrete-Trials Teaching

In a discrete-trial teaching, the antecedent is typically an instruction from the teacher, or a set of training materials or both. In ABA terms, if an antecedent is a cue that a response will be reinforced, then that antecedent is called a discriminative stimulus or S^D. In the example described previously, in which the teacher presented Anna with a ball, a box, and a can, and said "ball," the cue (or S^D) for Anna to point to the ball included both the instruction "ball" from the teacher and the presence of the ball in front of Anna. The reinforcer was the praise and the edible.

S^D ⇨ R ⇨ Reinforcer

Study Questions
14. Define discriminative stimulus or S^D and give an example.

PROMPTS

If a child is unable to respond correctly to antecedents, the teacher might provide some assistance to help the child do so. The assistance provided to increase the likelihood that a correct response will occur is referred to as a prompt. There are different types of prompts.

Study Question
15. Define prompt.

Physical Guidance

Physical Guidance (also called a physical prompt) consists of the teacher touching the child to guide him or her appropriately. In the example with the teacher and Anna, the teacher might provide a physical prompt by taking Anna's finger and pointing it to the ball after the teacher has said "ball".

Modeling Prompts

Modeling prompts occur when the teacher demonstrates the correct behavior. If the teacher wanted Anna to put a ball into a box, the teacher might first model the behavior of putting the ball into the box as an antecedent, and then give the ball to Anna so that Anna can imitate the teacher.

Gestural Prompts

Gestural prompts are certain motions that the teacher makes, such as pointing to the correct stimulus or making motions directed toward the child without touching him or her. Suppose the teacher wants Anna to put a ball into a box. The teacher might say, "Put the ball (while pointing to the ball) in the box (while pointing to the box)". The two pointing prompts would be gestural prompts. Note the difference between a modeling prompt and a gestural prompt. With a modeling prompt, the entire correct response is demonstrated by the teacher. With a gestural prompt, the teacher makes one or two gestures but does not model the entire correct response.

Vocal Prompts

Vocal prompts are spoken hints or cues. For example, suppose that a teacher is teaching Grace to label pictures of her family members. The teacher might hold up a picture of Grace's mom and say, "who is this? **Mom**". Grace might mimic "Mom" and be praised. In this instance, the teacher saying "Mom" was a vocal prompt for Grace to say who was in the picture.

Environmental Prompts

Environmental Prompts consist of alterations of the physical environment in a manner that will increase the likelihood of the desired behavior. For example, in the example with the teacher and Anna involving the ball, the box, and the can, if the teacher were to place the ball closer to Anna than either the box or the can, and then say "ball", the closer position of the ball would be an environmental prompt.

Some people might argue that, technically speaking, all of the categories of prompts are a part of the environment for a child. While that is true, the first four categories of prompts (physical guidance, modeling, gestural and vocal prompts) all involve the behavior of the teacher. In order to distinguish teacher-behavior prompts from other aspects of the physical environment, we define each category of prompts as described above.

Study Questions

16. What is physical guidance? Give an example.
17. What is a modeling prompt? Give an example.
18. What is a gestural prompt? Give an example.
19. What is a vocal prompt? Give an example.
20. What is an environmental prompt? Give an example

PROCEDURES FOR USING PROMPTS

Prompting is a useful teaching technique to increase the likelihood of correct responses by a learner. However, in everyday life, the children are likely to be asked to do things without receiving prompts. If a child can only respond when prompts are provided, the child is said to be prompt dependent. Therefore the goal of teaching is to teach a child to respond appropriately to a

variety of antecedents without accompanying prompts. We will describe 3 strategies for fading out the prompts.

Prompt Fading (Most-to-Least)

Consider the example given above to teach Grace to label family pictures. On the first trial, suppose that the teacher asked the question "who is this?" and added a full verbal prompt, "Mom". Assuming that Grace correctly said "Mom", and was reinforced, the verbal prompt might be faded across trials so that "Mom" would be faded to "mmm" and then to "m", and finally the teacher would just put her lips together. In this example, the fading of verbal prompts from most-to-least was successful in teaching Grace to label a picture of Mom.

The prompt that is initially required in order for the desirable behavior to occur is usually referred to as a **full prompt**. Anything less than that is usually referred to as a **partial prompt**. In the above example, the teacher saying "Mom" would be considered a full prompt, and the subsequent verbal prompts (i.e., "mmm", "m") are referred to as partial prompts. In most-to-least prompt fading the fading steps are often pre-determined and criteria are often pre-established for how many times each step is to be presented before going to the next step. Most-to-least prompt fading can be diagrammed as follows:

Trials	Antecedent	Behavior	Consequences
1	Teacher presents full prompt	Child responds correctly	Reinforcer is presented
2	Teacher presents partial prompt	Child responds correctly	Reinforcer is presented
3	Teacher presents an even more partial prompt	Child responds correctly	Reinforcer is presented
4	Continue fading prompts until a prompt is no longer required	Child responds correctly	Reinforcer is presented

Study Questions

21. Describe an example of prompt fading in which a prompt is faded from most-to-least.
22. Give an example of a full prompt.
23. Give an example of a partial prompt.

Graduated Guidance (a variation of most-to-least)

When some physical guidance is required to prompt a child to perform a correct response, the gradual elimination of that guidance across trials is sometimes referred to as **graduated guidance**. With this approach, you first use hand-over-hand guidance to help the child perform the task. Guidance is adjusted from moment-to-moment within a trial as needed, and subsequent trials typically begin with less guidance than preceding trials. Thus, the goals of graduated guidance are:

a) Within a trial use the least intrusive level or step of prompting necessary to make the behavior occur.
b) Across trials, fade out the level of prompts as quickly as possible from most-to-least.

Guidelines for Graduated Guidance:

a) Preliminary assessment to determine that guidance is required. Remember that graduated guidance refers to the gradual elimination of hand-over-hand guidance to help a child perform a task. You should first determine the amount of physical guidance needed to help the child perform each component of the task. Suppose, for example, that a teacher is teaching Mary to eat with a spoon, and the initial assessment shows the following:

Guidance Required	Component of a Trial
Full Guidance	Mary loads the spoon with food
A light touch	Mary moves the spoon from the plate to her mouth
Full Guidance	Mary puts the spoon full of food in her mouth

b) Within a trial, adjust prompting as needed. Within a trial the level of prompting is adjusted as needed. With the example of Mary above, the guidance within a trial was adjusted from full guidance to a light touch and then back to full guidance.

c) Across trials, fade out the prompts. Across trials, the levels of prompts (that continue to be adjusted within each trial as needed) are faded out as quickly as possible from most-to-least as follows:

Most: Full Guidance
Next: Minimal Physical Guidance (a light touch or shadow prompt)
Next: A Gestural or Modeling Prompt
Last: No Prompt

Study Questions
24. What kind of prompt is needed in the procedure called graduated guidance?
25. In a sentence, describe what happens within a trial during graduated guidance.
26. In a sentence, describe what happens across trials during graduated guidance.

Prompt Delay Procedure

This procedure involves a gradual change in the timing of the delivery of the prompt. You must first determine the level of prompting necessary to evoke the desired behavior from the child. This might be a full vocal prompt as described on page 7; "Mom", or a full or partial guidance, as described above. During the first few trials, at the beginning of the trial, you provide the necessary prompt immediately with other antecedents. Then, over trials, you gradually delay the prompt so that the child has an opportunity to respond to the antecedent without being prompted to do so. In the St. Amant ABA Teaching Program, staff increase the delay of a prompt according to the following specific steps:

Step	Delay	Action by teacher	Rule for advancing a step	Rule for returning to a step
1	0 seconds	Prompt immediately	3 consecutive correct responses	2 consecutive incorrect responses
2	2 seconds	Count to 1 and prompt on 2		
3	4 seconds	Count to 3 and prompt on 4		
4	-	No prompt	-	

Example: Suppose that a teacher is teaching Jason to identify items by their functions. The teacher provides the antecedent (the S^D) "tell me what we use for cutting paper," and immediately prompts, "scissors". Suppose that Jason says, "scissors", and is reinforced. This would be an example of Step 1 listed above. The trial would be repeated and after 3 consecutive correct responses across 3 trials, the teacher would move to Step 2 as listed above. That is, the teacher would provide the S^D, count 1 (a 1-second delay) and the say "scissors". If Jason responds correctly on 3 trials in a row the teacher would move on to Step 3 listed above. Suppose that, on Step 3 with the 4-second delay, Jason responds correctly before the prompt. Jason would be reinforced. And if this happened on 3 consecutive trials, it would not be necessary to proceed to Step 4.

Study Questions

27. In the prompt delay procedure, how many correct responses must occur before advancing to the next step in which the prompt is delayed more?
28. For the 4 steps of the prompt delay procedure, what is the delay of the prompt at each of the steps?
29. In the prompt delay procedure, if a child makes 2 consecutive incorrect responses when the prompts were delayed by 2 seconds, how long would the prompt be delayed in the next trial?

Inadvertent Prompts

Sometimes during teaching sessions, a teacher might unknowingly provide an inadvertent prompt to a child. Consider the case described previously when the teacher presented Anna with a ball, a box, and a can, and said "ball". Suppose that when the teacher said "ball", she inadvertently glanced at the ball. If Anna had noticed the teacher glancing at the ball, and then pointed to the ball, the teacher might incorrectly conclude that Anna understood the word "ball", when in fact, Anna was responding to an inadvertent prompt.

Guidelines for Avoiding Inadvertent Prompts

a) Always look at the child when you deliver instructions, never look at the stimuli that are a part of the S^D.
b) Maintain a neutral facial expression while delivering instructions
c) Keep the top of the table organized and display items so that they are arranged at equal distances from each other and from the child.

Study Questions

30. What is an inadvertent prompt? Give an example.
31. What are three guidelines for avoiding inadvertent prompts?

GUIDELINES FOR MANAGING ANTECEDENTS DURING DISCRETE-TRIALS TEACHING

Step 1: Check the procedure sheet for the stimuli to be presented

On some trials, you will present the participant with 1 item, such as a ball. On other trials you will present 2 items such as a ball and a box. On other trials, you will present 3 items such as described above for Anna when Anna was presented with a ball, a box, and a can. Check your data sheet to see which stimuli you will be presenting on the trials.

Step 2: Check the procedure sheet for the instruction to be presented

On some trials, you will say one word such as the teacher saying "ball" to Anna. On other trials, you will say several words such as "show me the ball". And across trials, you might be required to vary the words that you say. Check the procedure sheet to determine what you should say at the beginning of each trial.

Step 3: Require appropriate attending behavior

It doesn't make sense for you to present an instruction or S^D to a child on a trial if the child is looking away from you or is distracted by something, such as listening to a dog barking outside.

Therefore, before presenting an instruction or S^D you should:

- Ensure that the child is sitting appropriately
- Ensure that the child is looking at you
- Ensure that the child scans the stimuli presented

Step 4: Present the S^D (stimuli, instructions, and any required prompts) for the trial according to the procedure sheet

When you have done all of the above, then you can proceed on a trial like the teacher did with Anna when the teacher presented the 3 items on the table and said "ball".

Study Question

32. What are the 4 steps for managing antecedents during discrete-trials?

Chapter 3
Managing Consequences for Correct Responses During Discrete-Trials Teaching

In chapter 1 we introduced you to the principles of positive reinforcement, extinction and punishment. During discrete-trials teaching we want to ensure that correct responses are positively reinforced and incorrect responses are not reinforced (we don't use punishment). In this chapter we will describe positive reinforcement strategies.

POSITIVE REINFORCEMENT TOPICS

Categories of Reinforcers

Most reinforcers can be classified under 4 categories: consumable, social, activity and manipulative. Consumable reinforcers are things that the individual can eat or drink such as raisins, peanuts, or orange juice. Social reinforcers include praise and hugs. Activity reinforcers include activities like watching TV, listening to music, or going for a walk. Manipulative reinforcers include things like playing with a favorite spinning toy, playing with Lego, coloring, or completing a puzzle. The distinction between activity and manipulative reinforcers is fairly arbitrary. As you can see by the examples, manipulative reinforcers also involve activities, but they typically also include an object or objects that can be manipulated (such as crayons when coloring, or puzzle pieces while completing a puzzle).

Study Question
33. List 4 categories of reinforcers and give an example of each.

Token Reinforcers

Tokens are items that can be accumulated and exchanged for reinforcers called backup reinforcers. A program in which an individual can earn tokens for specific behaviors and can cash in their tokens for backup reinforcers is called a token system or a token program. For example, a teacher might implement a token system in which a child can earn poker chips for various behaviors such as one chip for each correct answer during a 30-minute teaching session. At the end of the session, the child might be allowed to cash in the poker chips for backup reinforcers such as 5 poker chips to play a computer game or 3 chips for 5 minutes of story time.

Study Questions
34. What is a token?
35. What is a token system?

Motivation for Reinforcers

Most reinforcers will not be effective unless the individual has been deprived of them for some period of time prior to their use. In general, the longer the deprivation period, the more effective the reinforcer will be. Sweets will usually not be reinforcing to a child who has just eaten a large bag of candy. The opportunity to play with a favorite toy will not be a reinforcer for child if the child has just played with that toy for a ½ hour or so. We use the term deprivation to indicate the time prior to a teaching session during whichan individual does not experience the reinforcer. The term satiation refers to that condition in which the individual has experienced the reinforcer to such an extent that it is no longer reinforcing.

Events or conditions – such as deprivation and satiation – that alter the effects of consequences as reinforcers are called **motivating operations**. In technical, language a motivating operation affects the function of a consequence and determines if a consequence will function as a reinforcer or not. In everyday language, a motivating operation affects the degree to which a person "wants" something.

Study Question
36. What is a motivating operation? Give an example.

Choice Opportunities to Assess Preferences

It is often quite effective to allow a child to choose among a number of available reinforcers. The choices can include edibles (e.g. popcorn or candy) and pictures of activities (e.g. playing catch or watching TV.). If a child is presented with a variety of items from which to choose (called a choice opportunity), and the child makes a choice, the item chosen is referred to as a preference. The advantage of offering a choice to identify a child's preference is that the chosen item is likely to be a strong reinforcer.

Study Question
37. What is the difference between a choice opportunity and a preference?

GUIDELINES FOR SELECTING REINFORCERS PRIOR TO DISCRETE-TRIALS TEACHING

a) Before a session, offer an array of 2 or 3 items and ask the child to "pick one". Let the child consume or briefly interact with (if it's an activity) that reinforcer, and then ask the child to pick one of the remaining items. The first two items chosen can be alternated during part of the session. You can repeat this many times during your session, and also offer choice opportunities following correct responses.

b) Watch the child during free play opportunities or when having a snack. Activities that the child enjoys, or edibles that the child likes, might then be used as reinforcers for the first few trials during a session, as long as the child has been deprived of such items for an hour or two before the session of if the child's behavior indicates he or she is still very interested in it. Such

items might be used so long as the child shows interest in the item, such as by consuming it immediately after you deliver it, or by trying to reach for it. Such items might be used so long as the child shows interest in the item, such as by consuming it immediately after you eliver it, or by trying to reach for it.

c) If the child has been eating, you could expect that he or she will become thirsty in which case a drink might be an effective reinforcer.

d) If the child has not had anything to eat in some time, then food is likely to be an effective reinforcer (unless it has been specified that edibles are not to be used as reinforcers for that child). The same applies to drinks.

Study Question

38. List four strategies for obtaining information about which reinforcers to use?

GUIDELINES FOR MANAGING REINFORCERS DURING DISCRETE-TRIALS TEACHING

a) Check the procedure sheet for the reinforcer to be used (such as a token, a consumable item, or access to an activity)

b) If tokens are to be used, keep them in your hand or on a Velcro strip attached to the table where they are easily accessed (they have to be delivered immediately)

c) Always include praise as a part of the reinforcing consequence. When using praise, be sensitive to the child's likes and dislikes. Some children enjoy loud excited praise, while other children prefer soft praise

d) When a correct **independent** response (a response without prompts) occurs the first time, provide extra reinforcers. If a token program is being used, this might involve giving 2 tokens instead of 1 or allowing immediate access to the backup reinforcer rather than waiting for the accumulation of all tokens. If edibles are being used, it might involve giving a larger edible than a smaller one.

Study Questions

39. What do we mean by an independent response (made by a child)?
40. What should you do following the first independent response made by a child?

Chapter 4
Managing Consequences for Incorrect Responses During Discrete-Trials Teaching

The prompting procedures described in Chapter 2 are designed to minimize the likelihood of errors occurring. In spite of our best efforts, however, the children will occasionally make errors. When an error does occur, the procedure that we apply typically involves four steps.

STEP 1: BLOCK (OR INTERRUPT) THE ERROR

Suppose, on a trial, you present a red crayon and a blue crayon in front of Suzie and you say, "blue". Suppose that Suzie's hand begins moving in the direction of the red crayon. In such instances where you detect that an error is in the process of being made, your goal is to stop the child's response before the response is finalized. The "blocking" needs to be done quickly, but very gently. Your efforts at interrupting or blocking an error should be done by placing your hand on the child's' hand or between the child's hand and the stimulus or materials, in order to block completion of the error. This should be done with a neutral facial expression and without vocal feedback such as saying "no".

Study Question
41. Describe the blocking procedure for reacting to an incorrect response.

STEP 2: PROVIDE CONSEQUENCES FOR AN ERROR (OR BLOCKED TRIAL)

Following a blocked trial, or an error that was not blocked, immediately remove the materials for that trial while looking down for 2 or 3 seconds. In the above example, the teacher blocked Suzie's completion of the incorrect response of reaching for the red crayon, then immediately removed the crayons while looking down.

In some teaching situations, there will not be any training materials to remove. Suppose, for example, that the teacher is teaching Jake to imitate simple actions. On a trial, the teacher waves her hand good-bye and says, "Do this". Suppose that Jake moves his hands as though he is going to clap (which he recently learned). The teacher would immediately place her hands on Jake's hands to prevent the completion of the clapping response, and then look down for 2 or 3 seconds. This should be followed by the error correction trial (step 3 below).

Study Question
42. What should the teacher do immediately following a blocked trial or an error ?

STEP 3: DO A CORRECTION TRIAL

After blocking, removing the stimuli while looking down for 2-3 seconds, proceed with an error correction trial as follows:

a) Provide the original stimuli (e.g., pictures or the action to be imitated) and instructions **plus** extra prompts. On the error correction trial, you should re-present the original stimuli and the original instruction and in addition provide a sufficient and immediate prompt to guarantee a correct response. In the example of Suzie on the previous page, the teacher would re-present the red and blue crayon in front of Suzie, say "blue", and then immediately (almost simultaneously) provide physical guidance to prompt Suzie to point to the blue crayon.

b) Provide less valued or less strong reinforcers than usual. A correct response to an error correction trial is to receive a lower value reinforcer than a response on a trial that did not contain an error. Typically, the teacher should provide non-enthusiastic praise such as "good" or "right" following a correct response to the error correction trial.

Following the correction trial where you prompted enough to guarantee a correct response, proceed to the next trial according to the data sheet and the appropriate step according to the child's previous responses (number of correct responses and errors in a row).

Study Questions

43. Describe the antecedents of the correction trial.
44. Describe the consequences of the correction trial.
45. What should you do after a successful correction trial?

Chapter 5
Guide for Teaching a Common Task - Matching

A task commonly taught to young children with autism is called *matching*. In one type of matching task, called **identity matching**, a child is required to match two identical items, such as two red balls of the same size. In a second type of matching task, called **quasi-identity** or **partial-identity** matching, a child is required to match two items that are physically similar in at least one respect, such as a red box and a red ball (matched on the basis of their identical color). In a third type of matching task, called **non-identity** matching, a child is required to match two items that go together but that are physically different, such as a sock and a shoe.

Let's suppose that you plan to conduct a training session to teach a child identity matching involving two identical pictures of a cat, two pictures of a house, and two pictures of a tree. Let's suppose also that a preliminary assessment (called a baseline) has indicated that the child is not able to perform identity matching using these items. Your training session might proceed as follows.

BEFORE STARTING TEACHING TRIALS

1) Check data sheet for correct targets: In this case, identity matching.

2) Gather materials: two identical pictures of a cat, two pictures of a house, and two pictures of a tree.

3) Select effective reinforcers: e.g., praise and edibles

CONDUCTING TEACHING TRIALS

4) Secure the child's attention

5) Present the stimuli: e.g., place a picture of a cat, a house, and a tree on the table in front of the child, and then give the child a picture of the cat.

6) Present the instruction: "Match"

PROVIDE NECESSARY PROMPTS (GRADUATED GUIDANCE AND PROMPT DELAY)

7) Use graduated guidance: Within a trial, use the least intrusive physical guidance needed to prompt the child to respond correctly, such as to place the picture of the cat held in his/her hand on the picture of the cat that is on the table.

8) Across trials: follow the prompt delay procedure (see Chapter 2).

PROVIDE CONSEQUENCES FOR CORRECT AND INCORRECT RESPONSES

9) Provide consequences: Give the child praise and an edible for responding correctly. (Because you used graduated guidance on this trial, there would likely not be an error. On subsequent trials, if the child made an error, you would use the procedure for blocking and correcting the error described in Chapter 4).

10) Record data immediately and accurately: as will be described in the next chapter.

Study Questions

46. What is an identity matching task?
47. What is a partial-identity matching task?
48. What is a non-identity matching task?
49. What are the three steps listed under "at the beginning of teaching trials"?
50. What is the correct instruction on a trial when teaching matching?

Chapter 6
Data Collection and Mastery Criterion

RECORDING CORRECT AND INCORRECT RESPONSES

A very important component of any behavioral intervention is data collection. The child's response on each trial is recorded to assist the teacher in determining:
a) the progress of learning by the child; b) which steps to implement in the discrete-trials teaching procedure according to the child's performance; and c) when mastery has been achieved.

Accuracy is paramount while collecting data during teaching trials, and recording data **immediately** after each trial is a good way to ensure **accuracy**. Data are usually collected on different aspects of the procedure and the child's response. Following are instructions to accurately record data.

Data on each trial, must indicate if the child responded correctly after a prompt, correctly without a prompt, that is, independently, or incorrectly on each trial. Consider an example previously presented where Anna was learning to point to objects presented on the table when her teacher labeled each item. When the teacher said, "box" and pointed to the box (prompt), and then Anna pointed to the box, then the teacher recorded on a data sheet that Anna's response was "correct - prompted".

Trials:	Correct Independent	Correct Prompted	Error
1. Box		✓	
2. Can			

On the next trial, when Anna pointed to the box after the teacher said, "box" but did not present any prompts, then the teacher recorded on a data sheet that Anna's response was "correct - independent."

Trials:	Correct Independent	Correct Prompted	Error
1. Box	✓		
2. Can			

If Anna had responded incorrectly, the response would have been recorded as an error.

Trials:	Correct Independent	Correct Prompted	Error
1. Box			✓
2. Can			

Study Questions

51. When recording the child's performance, when should data be collected?
52. What are 3 categories of responses that are recorded?

RECORDING PROCEDURAL VARIABLES: ERROR CORRECTION AND PROMPT DELAY

You will recall from Chapter 4 that, when a child makes an error, an error correction procedure is to be applied. Collecting data on performance during error correction assists in remembering to apply the error correction procedure immediately following each error. The error and the correct performance on the error correction procedure are recorded in the fifth and sixth columns of the data sheet as indicated below.

Trials	Prompt Delay Step	Correct Independent	Correct Prompted	Error	Correct on Error Correction
1. Arms up	3	✓			
2. Clap	3		✓		
3. Arms up	4			✓	✓
4. Hands ready	4			✓	✓
5. Clap	3		✓		

Study Question

53. In which column on the data sheet do you record the performance on the error correction trial?

An important part of the discrete-trials teaching procedure is the prompt delay procedure (see Chapter 2), which provides guidelines for gradually increasing the delay before giving a prompt, across trials. Recording the prompt delay step on the data sheet will increase your accuracy in correctly delaying the prompt. The prompt delay step on each trial is recorded in the second column on the data sheet as indicated below.

Trials	Prompt Delay Step	Correct Independent	Correct Prompted	Error	Correct on Error Correction
1. House	1		✓		
2. House	1		✓		
3. Cat	1		✓		
4. Tree	2		✓		
5. Cat	2	✓			
6. House	2		✓		
7. Tree	3		✓		
8. Tree	3	✓			
9. House	3			✓	✓
10. Cat	3			✓	✓
11. Cat	2		✓		
12. Tree	2			✓	✓

3 CORRECT in a row, move up 1 step

2 ERRORS in a row, move down 1 step

Study Question
54. In which column on the data sheet do you record the prompt delay step that you are following for a given trial?

MASTERY CRITERION

A mastery criterion is a criterion to determine that the child has learned the target exemplar; which implies that he or she can perform the skill correctly. We will consider a target exemplar mastered when the child has responded independently on 90% of the trials, or in 9 out of 10 trials. For example, if Anna were learning to point to a pictures of a cat, a house, and a tree, when the teacher said “cat” or “house”, or “tree”, mastery would be determined when Anna responded correctly and independently on 9 out of 10 trials across all three targets. It should be noted that 90% is a criterion commonly used by practitioners, but it is not a definitive rule.

Study Question
55. How do the authors of this manual define mastery?

Chapter 7
Summary of the Discrete-Trials Teaching Package

BEFORE STARTING TEACHING TRIALS:

1. Check data sheet for current targets
2. Gather materials according to current targets
3. Select effective reinforcer(s)

CONDUCTING TEACHING TRIALS:

4. Secure the child's attention

5. Present the stimuli
- **Matching**: 3 pairs of pictures
- **Motor Imitation**: motor action
- **Pointing to named pictures**: 3 pictures

6. Present instruction
- **Matching**: "Match"
- **Motor Imitation**: "Do this"
- **Pointing to named pictures**: "Show me [item in picture]"

PROVIDE NECESSARY PROMPTS: GRADUATED GUIDANCE AND PROMPT DELAY

7. Graduated Guidance: Within a trial modulate the intrusiveness of the physical prompt, fading assistance as the child responds correctly: Full Guidance ⇨ Partial Guidance ⇨ Gesture

8. Across trials, follow the prompt delay procedure:

Step	Delay	Action by te acher	Rule for advancing a step	Rule for returning to a step
1	0 seconds	Prompt immediately	**3** consecutive correct responses	**2** consecutive errors
2	2 seconds	Count to 1 and prompt on 2		
3	4 seconds	Count to 3 and prompt on 4		
4	-	No prompt	-	

PROVIDE CONSEQUENCES FOR CORRECT AND INCORRECT RESPONSES AND RECORD DATA

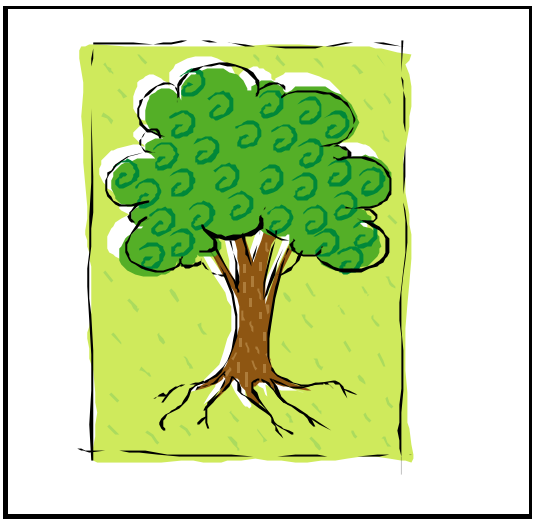
Following Correct Responses

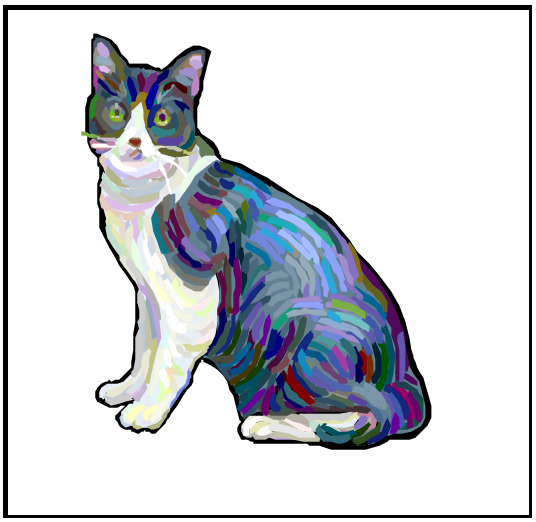
9. Praise and deliver reinforcer immediately
10. Record

Following Incorrect Responses

9. Block (interrupt) the response
10. Remove eye contact and stimuli for 2-3 seconds
11. Record the error
12. Re-present stimuli
13. Re-present instruction
14. Prompt to guarantee correct response
15. Praise non-enthusiastically
16. Record the correction trial

Appendix C. Pictures for Task 1





Appendix D. Pictures for Task 2

Appendix E. Confederate Scripts for Tasks 1, 2, 3

Step 1	**1**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**
Step 1	**3**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C***
Step 2	**5**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 3	**7**
Attending	**NA**
Delayed vs. Immediate	**I**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 3	**9**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**E**
Step 3	**10**
Attending	**NA**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**E***
Step 2	**11**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 1	**2**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**
Step 2	**4**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 2	**6**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C***
Step 3	**8**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**
ERROR CORRECTION	
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
ERROR CORRECTION	
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 2	**12**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**C**

Step 1	**1**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**

Step 1	**2**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**

Step 1	**3**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C***

Step 2	**4**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**E**

ERROR CORRECTION	
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 2	**5**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**-**
Correct vs. Incorrect	**E***

ERROR CORRECTION	
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 1	**6**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 1	**7**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 1	**8**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C***

Step 2	**9**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**C**

Step 2	**10**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 2	**11**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**C***

Step 3	**12**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**NP**
Correct vs. Incorrect	**C**

Step 1	**1**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 1	**3**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**
Step 1	**5**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**FP**
Correct vs. Incorrect	**C**
Step 2	**7**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 2	**9**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C***
Step 3	**11**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**-**
Correct vs. Incorrect	**C**
ERROR CORRECTION	
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**

Step 1	**2**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 1	**4**
Attending	**NA**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 1	**6**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C***
Step 2	**8**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**PP**
Correct vs. Incorrect	**C**
Step 3	**10**
Attending	**A**
Delayed vs. Immediate	**I**
Prompting Level	**NP**
Correct vs. Incorrect	**C**
Step 3	**12**
Attending	**A**
Delayed vs. Immediate	**D**
Prompting Level	**-**
Correct vs. Incorrect	**E**

Appendix F. Treatment Integrity Data Sheet Example

Treatment Integrity Data Sheet
Phase: 2. Self-Instructional manual

Participant:		**Date:**		**Start Time:**	
		By:		**End time:**	

Record if the experimenter followed this script when conducting this phase

+ indicates YES - indicates NO / indicates not applicable

	Task 1	**Task 2**	**Task 3**
1.Prepared area: appropriate for the task			
2.Sat down with participant and reviewed 'Activities Breakdown'			

3.INSTRUCTED PARTICIPANT:	**Task 1**	**Task 2**	**Task 3**
"You will try to teach [confederate] the same three tasks you tried to teach in the first session. But now using the summary page on Chapter 7 of the manual."			
*"Here is Chapter 7 and the data sheets. Start with **Task 1** and let me know when you are finished"*			
4.Waited for participant to finish Task 1			

5.INSTRUCTED PARTICIPANT:	**Task 1**	**Task 2**	**Task 3**
*"Now try **Task 2** and let me know when you are finished."*			
6.Waited for participant to finish Task 2			

7.INSTRUCTED PARTICIPANT:	**Task 1**	**Task 2**	**Task 3**
*"Now try **Task** 3 and let me know when you are finished."*			
8.Waited for participant to finish Task 3			
9.INSTRUCTED PARTICIPANT: *"I will score your performance and contact you to let you know about the next phase."*			

Appendix G. Social Validity Questionnaire Example - Experiment 1

Instructing Students on Discrete-Trials teaching for Children with Autism – Research Project by Daniela Fazzio – October 2006

Social Validity Questionnaire

Please complete this questionnaire with your answers to assist the researcher in evaluating the social importance of the conducted research. It is anonymous. Mark the number according to how much you agree or disagree with each statement. 5 indicates that you completely agree, 1 indicates that you completely disagree, 3 indicates that you are neutral, or do not agree nor disagree.

Example	**1 Disagree**	**2 Somewhat Disagree**	**3 Neutral**	**4 Somewhat Agree**	**5 Agree**
I am a parent of a child diagnosed with autism	✘	2	3	4	5
I am a university student	1	2	3	4	✘
	1 Disagree	**2 Somewhat Disagree**	**3 Neutral**	**4 Somewhat Agree**	**5 Agree**
Goals					
1. I think that the goal of the study; to teach students to conduct teaching sessions with children with autism is important.	1	2	3	4	5
2. I think that the goal of teaching students how to prompt correct responses when teaching children with autism is important.	1	2	3	4	5
3. I think that the goal of teaching students to reinforce correct responses while teaching children with autism is important.	1	2	3	4	5
4. I think that the goal of teaching students to correct errors made during teaching trials with children with autism is important.	1	2	3	4	5
Procedures					
5. The self-instructional manual to teach students to conduct discrete-trials teaching with children with autism was effective.	1	2	3	4	5
6. Demonstration and feedback in role-playing sessions to teach students to conduct discrete-trials teaching with children with autism was effective.	1	2	3	4	5
Effects					
7. I have learned to conduct discrete-trial teaching of three skills with children with autism.	1	2	3	4	5
8. I think that what I have learned can help me to teach a child with autism.	1	2	3	4	5
9. I have learned a new important skill by participating in this study.	1	2	3	4	5
10. I would recommend to other students that they participate in this training opportunity.	1	2	3	4	5